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Environmental Assessment

Invasive Plant Treatment Project

Santa Clara/Mojave Rivers Ranger District, Angeles National Forest
Los Angeles County, California

Portions of T3N, R14, 15W; T4N, R11, 12, 13, 14W; T5N, R13, 14, 15, 16, 17W; T6N, R13, 14, 15, 16, 17W; T7N, R14, 15, 16, 17, 18W, SBM in Los Angeles County, California

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CHAPTER 1 - INTRODUCTION

Background

Since the earliest days of human development and settlement, plant species have been spread into areas where they do not naturally grow. Beginning in the 1970's several Executive Orders were issued and laws passed to prevent further harm from these invasive non-native species and institute programs to correct damages already inflicted. The 2005 ANF Land Management Plan (LMP) further acknowledged that many of these species can damage and reduce the function of native ecosystems.

The Angeles National Forest Land Management Plan (Forest Plan) states, "….some of the greatest threats to riparian and aquatic habitats is from the invasion of non-native plant species, particularly tamarisk, arundo, and cape ivy within the stream channels…." (Forest Plan, part 1, p. 41; USFS 2005). The desired conditions for the project area are to have structure, function, and composition of plant communities and wildlife habitat unimpaired by the presence of invasive non-native plants (Forest Plan, part 1, p. 32; USFS 2005); to have the watercourses functioning properly with riparian vegetation consisting primarily of native species, with minimal or no presence of invasive non-native plants (Forest Plan, part 1, p. 41; USFS 2005); and to reduce and control exotic species over time to restore healthy riparian systems (Forest Plan, part 2, pp. 42, 66; USFS 2005).

Appendix M, Part 3 of the Forest Plan provides detailed strategy and direction on working with partners to achieve invasive species goals across the entire watershed. The proposed project is consistent with the various goals, objectives, and strategies outlined in the LMP. (Forest Plan, part 3, pp. 121-130; USFS 2005).The Forest Plan (USFS 2005) has goals to reverse the trend of increasing loss of natural resource values due to invasive species (Goal 2.1), retain a natural evolving character within wilderness (Goal 3.2), improve watershed conditions through cooperative management (Goal 5.1), improve riparian conditions (Goal 5.2), and provide ecological conditions to sustain viable populations of native and desired non-native species (Goal 6.2). The Forest Plan Weed Management Strategy (appendix M in the Forest Plan, part 3) includes coordinating with the Los Angeles Weed Management Area (WMA) to continue controlling and/or removing German and English Ivy, Vinca, and Spanish broom in Bouquet Canyon; yellow star-thistle on the Santa Clara/Mojave Rivers Ranger District; distaff thistle in San Francisquito, Bouquet and Soledad Canyon. Appendix M also directs the Forest to coordinate with the State of California for tamarisk removal in upper Castaic Creek.

Appendix M Part 3 also includes coordinating with the Los Angeles WMA to monitor status of halogeton along California State Highway 14 near national forest boundary, perennial pepperweed in the Santa Clara River near the National forest boundary, and apiary sites for yellow star-thistle, spotted knapweed, and other invasive plants.

Forest Service Manual direction for Invasive Species Management is contained in a new manual section, FSM 2900, effective December 5, 2011. This direction sets forth National Forest System policy, responsibilities, and direction for the prevention, detection, control, and restoration of effects from aquatic and terrestrial invasive species (including vertebrates, invertebrates, plants, and pathogens). This new chapter replaces FSM 2080 (Noxious Weed Management). Some of the policy direction found in FSM 2900 that is most related to this project is excerpted below:

- Initiate, coordinate, and sustain actions to prevent, control, and eliminate priority infestations of invasive species in aquatic and terrestrial areas of the National Forest System using an

integrated pest management approach, and collaborate with stakeholders to implement cooperative invasive species management activities in accordance with law and policy.

- Ensure that all Forest Service management activities are designed to minimize or eliminate the possibility of establishment or spread of invasive species on the National Forest System, or to adjacent areas. Integrate visitor use strategies with invasive species management activities on aquatic and terrestrial areas of the National Forest System. At no time are invasive species to be promoted or used in site restoration or re-vegetation work, watershed rehabilitation projects, planted for bio-fuels production, or other management activities on national forests and grasslands.

- Use contract and permit clauses to require that the activities of contractors and permittees are conducted to prevent and control the introduction, establishment, and spread of aquatic and terrestrial invasive species. For example, where determined to be appropriate, use agreement clauses to require contractors or permittees to meet Forest Service-approved vehicle and equipment cleaning requirements/standards prior to using the vehicle or equipment in the National Forest System.

- Monitor all management activities for potential spread or establishment of invasive species in aquatic and terrestrial areas of the National Forest System.

- Manage invasive species in aquatic and terrestrial areas of the National Forest System using an integrated pest management approach to achieve the goals and objectives identified in Forest Land and Resource Management plans, and other Forest Service planning documents, and other plans developed in cooperation with external partners for the management of natural or cultural resources.

- Develop and utilize site-based and species-based risk assessments to prioritize the management of invasive species infestations in aquatic and terrestrial areas of the National Forest System. Where appropriate, use a structured decision making process and adaptive management or similar strategies to help identify and prioritize invasive species management approaches and actions.

- Establish and maintain a national record keeping database system for the collection and reporting of information related to invasive species infestations and management activities, including invasive species management performance, associated with the National Forest System. Require all information associated with the National Forest System invasive species management (including inventories, surveys, and treatments) to be collected, recorded, and reported consistent with national program protocols, rules, and standards.

- Where appropriate, integrate invasive species management activities, such as inventory, survey, treatment, prevention, monitoring, and so forth, into the National Forest System management programs. Use inventory and treatment information to help set priorities and select integrated management actions to address new or expanding invasive species infestations in aquatic and terrestrial areas of the National Forest System.

- Assist and promote cooperative efforts with internal and external partners, including private, State, tribal, and local entities, research organizations, and international groups to collaboratively address priority invasive species issues affecting the National Forest System.

- As appropriate, collaborate and coordinate with adjacent landowners and other stakeholders to improve invasive species management effectiveness across the landscape. Encourage cooperative partnerships to address invasive species threats within a broad geographical area.

The Santa Clara River has been severely degraded by invasive, nonnative plants which have increased over time. In 2006, The Upper Santa Clara River Watershed Arundo/Tamarisk Removal Plan (SCARP) and EIR were completed by the Ventura County Resource Conservation District and dozens of federal, state and local cooperators. The Forest Service was a cooperator, but needed to complete National Environmental Policy Act (NEPA) compliance to treat invasive species on National Forest System lands before on-the-ground projects could be completed. Subsequent to the SCARP, the Santa Clara River Invasive Plant Removal Project (SCIPR) was started, and now the entire Santa Clara River Watershed is, or will be, covered from the headwaters to the coast. Projects are being implemented downstream of the National Forest, but the long term success in controlling invasives in the entire watershed will be dependent on the ability of the upstream landowners, like the Forest Service, to control invasive plants in the headwaters. The California Department of Fish and Game (CDFG), U.S. Fish and Wildlife Service (USFWS), and the state and federal water management agencies are all partners in this Santa Clara River restoration effort, and these groups have expressed support for the Forest Service treating invasive plants in the upper watershed.

The Santa Clara/Mojave Rivers Ranger District implemented an arundo (*Arundo donax*) eradication project between 1995 and 2005 in Soledad Canyon and San Francisquito Canyon. Arundo is a destructive pest affecting all of the large river systems in southern California. The District has been successful in controlling population expansion at treatment sites, but other invasive plant species, such as tamarisk and tree-of-heaven, have become established. Some arundo is beginning to show up in small amounts in the treated areas once again. The original decision to treat arundo is over 15 years old. The purpose of this environmental assessment is to update and expand the original project's purpose and need, project area, and approved treatment activities.

Purpose and Need for Action

If the invasive species are left unchecked, the ecosystem in this watershed could be dramatically changed. Invasive plants could create a host of adverse environmental effects, including: displacement and loss of native plants; alteration of the hydrology of riparian habitat, reduction in habitat and forage for wildlife (including threatened, endangered, and sensitive species); reduction in water quantity; potential reduction in soil productivity; and potential increases in the intensity and frequency of wildland fires. After wildland fires in this area, non-native plant species typically re-establish more rapidly than native plants, suppressing the recovery of the native vegetation and allowing the invasive plants to expand their range. In addition, when wildland fires occur too frequently (tamarisk and arundo-dominated communities experience higher fire frequencies than native riparian communities), some of the native vegetation lose the ability to recover, effectively converting high diversity native plant communities into low diversity non-native communities.

Based on national, agency, and Forest direction, the needs for this project are to:

- Eradicate, control, contain, and/or suppress[1] existing invasive plant species in the Santa Clara River and its tributaries from the Forest boundary to the headwaters.

[1] Eradicate is to totally eliminate an invasive plant species from the project area; control is to reduce the infestation over time but some level of infestation may be acceptable; contain is to prevent the spread of the invasive plants beyond the perimeter of patches or infestations presently existing; and, suppress is to prevent seed production throughout the target patch and reduce the area coverage, preventing the invasive species from dominating the vegetation in the area where low levels may be acceptable.

- Provide for aggressive treatment of new infestations of invasive plants (in terms of new areas and new species) to allow for rapid treatment and containment of small infestations before they become established.
- Focus on invasive plant species that are classified as undesirable, noxious, harmful, injurious, or poisonous, including but not limited to State listed high priority noxious weeds (such as arundo, tamarisk, and tree-of-heaven).
- Cooperate with state and county agencies and private landowners interested in managing invasive plants within the project area.

In meeting the needs for action, the following purposes (objectives) will be achieved:

- Improve riparian habitat, aquatic conditions, and the overall quality and quantity of water.
- Contain and/or eradicate highly flammable and fire-adapted invasive plant species (e.g. arundo, tamarisk) that have the potential to increase fire severity and increase the frequency in occurrence of damaging wildfires in these drainages.
- Minimize adverse impacts from the project to populations of threatened, endangered, and/or Forest Service sensitive plant and wildlife species.
- Minimize adverse impacts to the native riparian and upland vegetation within the project area.
- Provide for health and safety during implementation of the project to nearby residents, forest visitors, and project implementers.

Decision Framework

The Santa Clara/Mojave River District Ranger is the Responsible Official for this project. The District Ranger will decide whether to approve the proposed action, approve a modification to the proposed action, or take no action on treating the vegetation related to this project at this time.

Public Involvement

The project was listed in the Schedule of Proposed Actions (SOPA) on the Angeles National Forest internet webpage beginning on April 1, 2010 and every quarter since. Scoping and public notification were conducted to inform the public of the proposal and provide them an opportunity to raise any issues associated with this invasive plant treatment proposal. A scoping letter was mailed out to approximately 370 agencies, groups, and individuals on August 18, 2010, which included a summarized description of the proposed action. A legal notice informing the public of this project proposal (with a 30-day scoping period) was published August 18, 2010, in the *LA Daily News*. The detailed purpose and need and proposed action document, map, and scoping letter were included on the Forest websites under "Projects and Plans" starting August 18, 2010. (http://www.fs.fed.us/r5/angeles/projects/). This internet site was referred to in both the legal notice and scoping letter.

Additional requests for input were sent to Native American tribes, groups and individuals. On September 21, 2010, the Forest Supervisor sent letters to two potentially affected tribes. A letter was also sent to 121 individuals and groups on the Forest list for the Native American community potentially interested in vegetation management projects. Using the comments from the public and internal resource specialists concerns the interdisciplinary team recommended a list of issues to be addressed with the responsible officials' agreement.

Issues

The Forest Service received and reviewed comments from fourteen individuals/groups, both orally, by e-mail, and in writing, during the scoping period. The Forest also received suggestions from the District and Forest staff. The Forest analyzed these comments to determine what the issues were related to this project proposal. Issues are points of discussion, dispute, or debate about the environmental effects of proposed actions. A list of comments and how they have been used are noted in appendix A in this document. Some comments were used to generate issues and some were used to direct the needed analysis. Many of the comments supported the proposed action with specific recommendations.

The interdisciplinary team recommended and the responsible officials approved three key issues that would be addressed in the analysis based on the internal and external scoping:

1. Herbicides can be toxic and have unknown effects to humans, including carcinogenicity, reproductive and developmental toxicity, neurotoxicity, and acute toxicity.
2. Herbicides can be toxic and have unknown effects to aquatic organisms, mammals, and birds.
3. Failure to successfully treat invasives on the National Forest will have adverse effects on National Forest resources as well as downstream and adjacent landowners and water suppliers.

In addition, this document addresses the effects from this project for the following resources: invasive plants, special status plant and animal species (i.e., species protected under the Endangered Species Act and Forest Service sensitive), hydrology, special land designation areas (i.e., wilderness), recreation, and scenic resources.

CHAPTER 2 - ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This Chapter describes the alternatives that were considered to determine if they would achieve the purpose and need discussed in Chapter 1 of this document. Alternative 1 is the no action; alternative 2 is the proposed action; and alternative 3 was developed in response to the issues identified during scoping and noted above (i.e., unknown herbicide toxicity). In addition, design features (protection/mitigation measures) are incorporated into the alternative descriptions and are included in this chapter. The intent of these measures is to decrease potential adverse effects to people and the environment. This chapter also acknowledges alternatives considered but eliminated from detailed analysis. A table at the end of this chapter presents the alternatives in comparative form, displaying summary differences between the three alternatives and providing a basis for choice among options by the decision makers and the public.

Alternative 1, No Action

Under the no action alternative, only very minor treatment of invasives would occur. This would be primarily at project sites where separate project specific analysis and NEPA compliance had been a part of the project. The small amount of work that is being done currently is almost entirely manual treatment in the few areas where manual treatment alone can be successful. The no action alternative would not preclude doing NEPA compliance for invasive plant treatment activities in the project area at some time in the future. This alternative represents the existing condition and expected future conditions (in the absence of this project), against which the other alternatives are compared.

Alternative 2, Proposed Action

The District Ranger of the Santa Clara/Mojave Ranger District is proposing the eradication, control, containment, and/or suppression of existing and new infestations of invasive plant species that are undesirable, noxious, harmful, injurious, or poisonous, including but not limited to State-listed high priority noxious weeds (such as yellow star thistle, arundo, tamarisk, and tree-of-heaven) in the Santa Clara Watershed. The project area includes all National Forest System lands within this watershed, Treatment areas (Figure 1 and 2) would include non-National Forest System lands if the landowners/managers would like to enter into a cost-share agreement authorized under the Wyden Amendment or some other available authority. The project would be a long-term commitment for invasive plant management in the project area due to new species entering into the project area, re-colonization of treated species, and expansion of existing populations. The term of this project would be 15 years with the intent to review and, if needed, update the project, effects analysis, and possibly purpose and need after 15 years of implementation. No new roads or trails are proposed as a part of this project. Off-highway motorized equipment will not generally be permitted for implementing this project. On a case by case basis, the District Ranger will determine if exceptions are needed in certain locations where resource damage can be avoided and it is important in implementation. The wildlife biologist, botanist and archeologist will review the proposal for the Ranger to make sure heritage resources and threatened and endangered species and critical habitat are protected.

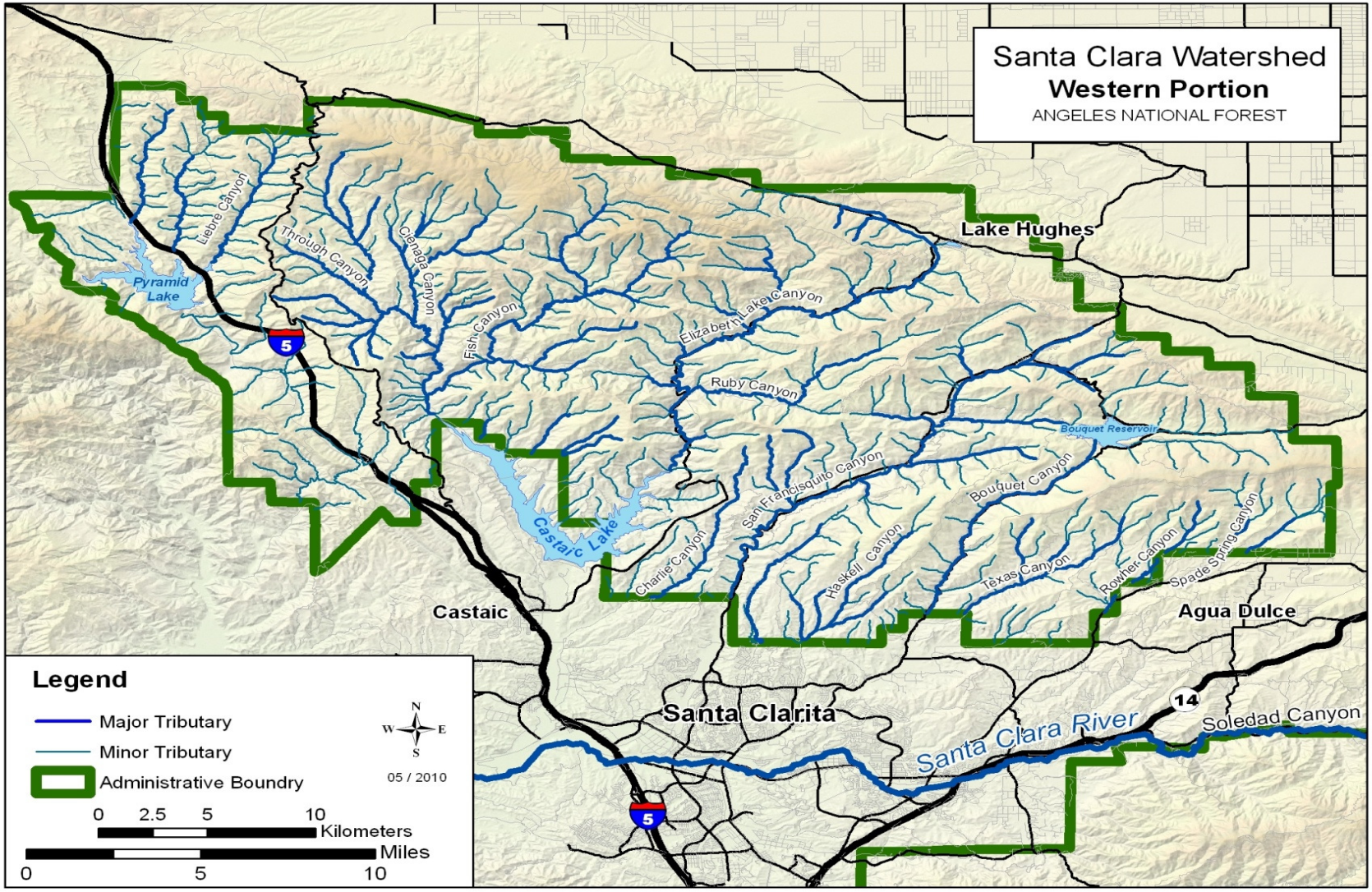
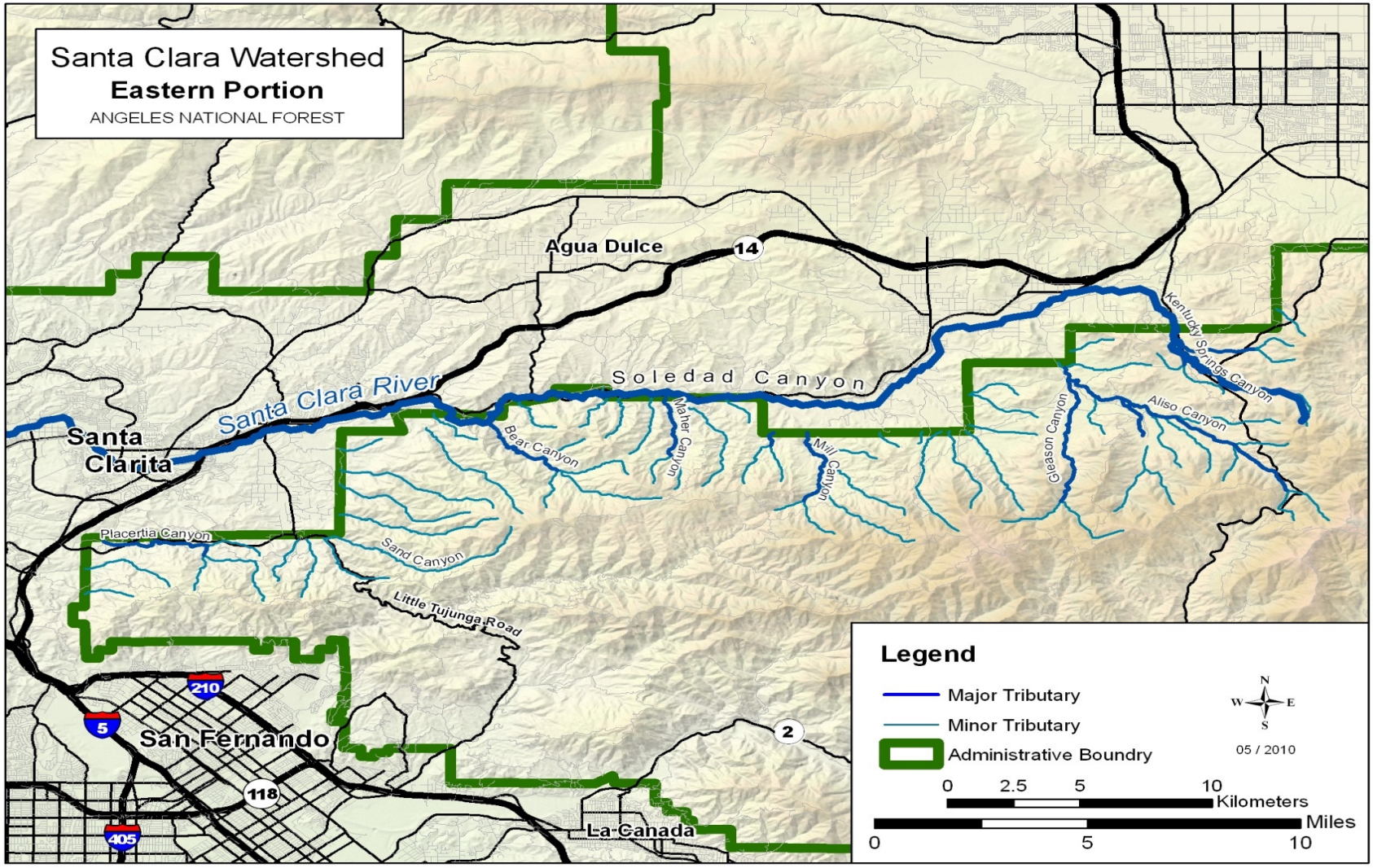


Figure 1. Project Area Map, West Side.

Figure 2. Project Area East Side



Alternative 2, Proposed Action - Adaptive Management Strategy

Invasive plant infestations constantly change and evolve, as do the treatment methods. Early detection and rapid containment of invasive plants is the most efficient method for controlling their spread. The proposed action includes an adaptive management strategy that addresses these types of changes over the life of this project to allow for a rapid response for control and/or containment. New treatment methods (including change in concentrations or application methods of approved herbicides and/or biological control agents analyzed and approved for use by the US Department of Agriculture, (Agricultural Plant Health and Insect Services) and California Dept. of Food and Agriculture, treatment of new species, and/or treatment of new areas within the project area would be part of the proposed action as long as the scope of the treatment and the effects are within those addressed in this document.

This strategy would not allow for the use of new herbicides not addressed in this document; would not allow for "broadcast"[2] (including aerial or boom sprayer) applications of herbicides; would not allow herbicide use during pre-emergence of vegetation (preventing the invasive plant from germinating); and would not allow large and heavy equipment into the treatment areas (e.g. large bull dozers). The use of any new herbicides, broadcast applications, pre-emergent herbicide application, or use of large and heavy equipment (large dozers) would require new National Environmental Policy Act (NEPA) analyses, public involvement, documentation and decision. Appendix D, Section 3.1.2 provides a decision key that incorporates the adaptive management strategy approach.

Annual Implementation Review Process

As part of the adaptive management strategy, the Forest will have an annual Invasive Species Management Implementation Review Meeting/Workshop. At this time, the proposed plan of work for the upcoming year will be reviewed, and any lessons learned from previous monitoring and implementation would be incorporated into the annual program of work. Other Districts and Province Forests as well as partners in invasive species management will be invited to share lessons learned.

Any new information affecting planned implementation would be reviewed by an appropriate interdisciplinary team; documented; and annual treatment approved by the District Ranger and Forest Resource Officer. The interdisciplinary team will include personnel as determined by the Resource Officer and affected District Rangers, but will include as a minimum, an archeologist and biologist to insure protection of heritage resources and threatened and endangered species and their critical habitats. The documentation of the meeting would be included in the project record available for public review.

Alternative 2, Proposed Action – Priority Species

There are a large variety of invasive species presently known to exist within the project area. This alternative divides invasive plant species into three categories: high, moderate, and low-priority species. Table 1 provides a summary of the high and moderate priority species that presently exist within the project area

[2] Broadcast spraying is defined as spraying via ground vehicles or aircraft with hose sprayers or booms using an array of spray nozzles. This method is not selective and all species, both native and non-native are sprayed. Bare soil between plants is generally sprayed as well.

Table 1. List of high and moderate priority invasive plants.

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Common name	*Taxon name*
High Priority Invasive Plant Species	
Arundo, Giant Reed	*Arundo donax*
Saltcedar, Tamarisk	*Tamarix spp.*
Tree of Heaven	*Ailanthus altissima*
Spanish Broom	*Spartium junceum*
Tree Tobacco	*Nicotiana glauca*
Yellow Star Thistle	*Centaurea solstitalis*
Moderate Priority Invasive Plant Species	
Perennial Pepperweed	*Lepidium latifolium*
Eupatory	*Ageratina adenophora*
Brome Grasses	*Bromus spp.*
Pampas Grass	*Cortaderia spp.*
Scotch Broom	*Cytisus scoparius*
Cape-ivy, German-ivy	*Delairea odorata*
Fennel	*Foeniculum vulgare*
French Broom	*Genista monspessulana*
English Ivy, Algerian Ivy	*Hedera helix, H. canariensis*
Italian Ryegrass	*Lolium multiflorum*
Crimson Fountaingrass	*Pennisetum setaceum*
Castorbean	*Ricinus communis*
Himalayan Blackberry	*Rubus armeniacus (Rubus discolor)*
White sweetclover	*Melilotus alba*
Bigleaf Periwinkle	*Vinca major*

Most treatment strategies would be intended to eradicate or control the high-priority invasive plant species. Dependent on location, invasive plant species, and potential vectors in the area, the strategy to manage the moderate and low-priority invasive plant species would consider containing and/or suppressing.

Alternative 2, Proposed Action – Invasive Species Treatment Prescriptions

Prescriptions for treatment would follow integrated weed management (IWM) for each treatment site. No single management technique or treatment method is perfect for all invasive plant treatment situations. Multiple management actions are required for effective treatment. Integrated weed management includes an approach for selecting methods for eradicating, containing, controlling, and/or suppressing invasive plants in coordination with other resource management activities to

achieve optimum management goals and objectives. This approach uses a combination of treatment methods, that when taken together, would eradicate, contain, control, or suppress a particular invasive plant species or infestation efficiently and effectively, with minimum adverse impacts to non-target organisms. This approach contrasts with the traditional approach of using a single treatment type, such as applying herbicides, to treat all invasive plant problems. Herbicides are one useful technique, but they are not the only method to control invasive plants and may not always be the most effective. In addition, there are multiple herbicides that can treat a given invasive plant species. Integrated weed management is species-specific, tailored to exploit the weaknesses of a particular invasive plant species, site-specific, and designed to be practical with minimal risk to the organisms and their habitats (Colorado Natural Areas Program 2000).

Potential herbicide and manual/mechanical treatment prescription options for many known and expected invasive plants are provided in Appendix C.

Alternative 2, Proposed Action - Treatment Methods

Proposed treatment methods include biological control (e.g. insects, pathogens), manual/mechanical, fire wilting, and herbicide. These treatment methods are divided up further into specific types of treatment methods and are summarized in table 2. The timing of herbicide treatments would be dependent on the invasive plant species, location of the population, temperature extremes, restrictions for species protection, as well as wind and rain restrictions (which vary by herbicide). The Regional Forester must pre-approve any herbicide or biological control treatment in the Magic Mountain Wilderness (Forest Service Handbook (FSH) 2109.14, 13.4; USFS 1994a; Forest Service Manual (FSM) 2323.04c; USFS 2007b). This needed approval would occur before a decision in made on this project.

Depending on the size of the activity generated material (invasive plants), treatment of this material (biomass) could include pile and burning adjacent to or at the treatment site (at a minimum, outside the 25-year floodplain), drag and remove off site (if vehicle access is adjacent to treatment area), or helicopter sling load material out of the treatment area for disposal off site (e.g. if the access is poor and pile and burning in place is not an option. If the biomass material is minimal, the material could be scattered above the high waterline to dry and decompose. Sites where tamarisk plants receive herbicide treatment would not be burned, and treated plants would not be cut for two growing seasons after initial treatment because disturbing the treated plants can induce some to resprout. Some material resulting from treatment may be sold or given away as special forest products (flower arrangements etc.) or used as biomass for approved purposes.

The selection of treatment method would be dependent on time of year; severity of infestation; presence of sensitive resource areas (e.g. native plants and wildlife species, including protected species); degree of intermixing of invasive species with sensitive native habitats; access; proximity to surface water; and budget.

Table 2. Summary of treatment methods proposed.

Method	Description
Biological Control Method	
Biological Control Agents	Biological control agents are normally insects or pathogens that attack specific invasive plant species. Prior to allowing use, US Department of Agriculture, Agriculture Plan Health and Insect Service (APHIS) is required to complete NEPA analysis and documentation. There is only one potential biological control agend that has this required analysis completed, *Eustenopus villosus*. It is the only species which will be used for this proejct. Use of this method would comply with the APHIS NEPA document and decision. Biological control would only be used to target yellow starthistle. Advantages and disadvantages –suppresses the spread of infestations but would not likely

Method	Description
	eradicate the invasive plant populations. If successful, can provide permanent, widespread control with a favorable cost:benefit ratio.
Manual/Mechanical Methods	
Hand Pulling	Pulling or uprooting plants can be effective against some shrubs, tree saplings, and herbaceous invasive plants. Annuals and tap-rooted plants are particularly susceptible to control by hand pulling. It is not as effective against many perennial invasive plants with deep underground stems and roots that are often left behind to resprout. The advantages of pulling include its initial small ecological impact, minimal damage to neighboring plants, and little (or no) cost for equipment or supplies. Normally effective with small populations and/or where a large pool of volunteer labor is available. The key to effective hand pulling is to remove as much of the root as possible while minimizing soil disturbance. For many species, any root fragments left behind have the potential to re-sprout, and pulling is not effective on plants with deep and/or easily broken roots. Disadvantages are that this method is labor and time intensive. Often times there are low mortality rates, which require repeated re-treatments to be effective, which could increase the project cost and frequency of disturbance to the treatment area.

Method	Description
Manual/Mechanical Methods	
Pulling Using Tools	Most plant-pulling tools are designed to grip the plant stem and provide the leverage necessary to pull its roots out. Tools vary in their size, weight, and the size of the invasive plant they can extract. The Root Talon is inexpensive and lightweight, but may not be durable or effective as the all-steel Weed Wrench, which is available in a variety of sizes. Both work best on firm ground as opposed to soft, sandy, or muddy substrates and in small areas with easy access. Advantages are initial small ecological impact and minimal damage to neighboring plants. Normally effective with small populations and/or where a large pool of volunteer labor is available. Disadvantages include both tools can be cumbersome and difficult to carry to remote sites, this method can be labor and time intensive, often requires repeated re-treatments to be effective, which could increases the project cost and frequency of disturbance to the treatment area. Could spread invasive plants to other sites if equipment is not cleaned before leaving an infected site.
Clipping and Cutting	"Clipping and Cutting" requires cutting a portion of the invasive plant stem, generally cutting the bole of the tree/plant with cutting tools such as chainsaws, weed wacker/whip/eater. Advantages and disadvantages are similar to the "pulling using tools" method as noted above. Another disadvantage is that many species can resprout from the base.
Girdling	For trees (e.g. tamarisk), the main trunk of the trees would be stripped of the bark (consisting of secondary phloem tissue, cork cambium, and cork) around a tree's outer circumference, causing its death. Death occurs from the inability of the leaves to transport sugars (primarily sucrose) to the roots. Advantages to this treatment method are minimal ground disturbance and effective in killing larger sized trees. A disadvantage is that it takes time for the tree to die and during that time the tree can still produce seed. Another disadvantage is that some species can resprout from the base.
Tarping	Invasive plants would be cut back within inches of the ground and opaque thick tarps or pond liners would be staked or weighed down over the treatment area. The tarp(s) would be applied in late spring/early summer and remain for up to 5 months, usually from June to November. This treatment is best used in small areas (less than 0.25 acres) where there is not an intermix of native plants. Advantages to this treatment method are minimal ground disturbance and it has been known to be effective in small areas. Disadvantages are limited size of treatment area, could damage soil microorganisms, and high monitoring needs in high public use areas to ensure the tarp is left in place.
Fire-wilting Method	
Flaming Weed Torch	The weed torch is a treatment method that utilizes a propane torch to kill individuals but not ignite them This treatment is known as flaming, wilting, or blanching and the equipment can

Method	Description
	be carried by an indiviudal. The weed torch would only be used during times of low fire danger and in areas where there is low potential to carry fire. The most effective application is for the control of small diameter woody vegetation (one inch in diameter or less) such as French broom, other broom species and gorse, seedlings, and nonwoody grasses and forbs. To reduce potential for wildfire, 'flaming' is typically only undertaken when vegetation is very wet- either during or immediately after a rain event, or when vegetation is damp from fog and on low wind days (less than 5 mph is preferable). An advantage to this form of treatment is that it has very minimal environmental impact. A disadvantage is the limited window of opportunity for treatment.
Herbicide Methods	
Hand/Selective	Treatment of individual plants to avoid spraying other desirable plants. There is a low likelihood of drift or delivery of herbicides away from treatment sites. This method is used in sensitive areas, such as near water, to avoid getting any herbicide on the soil or in the water. Specific methods include: a) Foliar Application (including basal bark) – These methods apply herbicide directly to the leaves and stems/trunk of a plant. An adjuvant or surfactant is often needed to enable the herbicide to penetrate the plant cuticle, a thick, waxy layer present on leaves and stems of most plants. These applicators range from backpack sprayer, to hand-pumped spray or squirt bottles, which can target very small plants or parts of plants. b) Spot spraying – Spot spraying is similar to foliar spraying but would be for larger sized plants and/or population of plants. The focus still is on treating individual plants (instead of broadcast spraying) but over a larger area. Applicators would typically be backpack sprayers. Because of the potential to treat larger areas and larger sized vegetation, this method has a slightly higher potential for drift. c) Frill or Hack and Squirt – The frill method, also called the "hack and Squirt" treatment, is often used to treat woody species with large, thick trunks. The tree is cut using a sharp knife, saw, or ax, or drilled with a power drill or other device. Herbicide is then immediately applied to the cut with a backpack sprayer, squirt bottle, syringe, or similar equipment. d) Cut-Stump – This method is often used on woody species that normally resprout after being cut. Cut down the tree or shrub, and immediately spray or squirt herbicide on the exposed cambium (living inner bark) of the stump. The herbicide must be applied to the entire inner bark (cambium) within minutes after the trunk is cut. The outer bark and heartwood do not need to be treated since these tissues are not alive, although they support and protect the tree's living tissues. The cut stump treatment allows for a great deal of control over the site of herbicide application; therefore, has a low probability of affecting non-target species or contaminating the environment. It also requires only a small amount of herbicide to be effective. e) Cut, Resprout, and Spray or Paint/Daub – Cut 1-2 months prior to spraying. Apply herbicide when resprouts are 2-4 feet tall, but most effective in early fall through winter when plant chlorophyll is transferred to roots. Herbicide should be applied on dry days and during low winds. f) Stem Injection – Herbicides can be injected into stems using a needle, syringe, or special cutting tools, such as basal injectors or breast height injectors. g) Basal Bark Treatment - Herbicide is applied to the base of individual woody plants or stems - individual plant treatment. The herbicide penetrates through the bark to the cambium, where it translocates to roots and stems for complete control. Used for trees less than 6 inches in diameter and trees that are too tall for foliar application. h) Wicking application - applying a herbicide consists of a wick or rope soaked in herbicide from a reservoir attached to a handle. The wetted wick is used to wipe or brush herbicide over the weed. Advantages include little soil disturbance, highly selective and effective with little risk of drift of herbicide onto non-target species. Disadvantages include labor intensive and weather conditions must be suitable for herbicide application (and for stem injections, equipment could be expensive). For immediate herbicide treatment after cutting, coordinating cutting and herbicide application in a timely fashion would be difficult. A disadvantage of herbicide treatment is the potential for toxicity effects from the chemicals used.

Depending on the invasive plant species, over time, the amount and concentration of herbicide needed would likely decrease and the amount of manual treatment could increase as the project enters into a monitoring and management phase with only small pockets or individual scattered plants needing treatment.

Herbicide Treatment Method

The five herbicides that are considered as treatment options in the proposed action include: aminopyralid, chlorsulfuron, glyphosate, imazapyr, and triclopyr. Table 3 provides a summary of the typical application rate and range planned for each herbicide. These five herbicides were chosen because of their effectiveness in controlling specific target plants while being some of the safest herbicides available for invasive plant treatment in natural areas.

Table 3. Summary of range of and typical application rates for each herbicide proposed.

Herbicide	Range of application rate (pounds of acid equivalent/acre [lb a.e./acre])	Typical application rate (lbs a.e./acre)
Aminopyralid	0.03 to 0.11	0.078
Chlorsulfuron	0.0059 to 0.83	0.056
Glyphosate	0.5 to 8	3
Imazapyr	0.03 to 4	0.45
Triclopyr	0.05 to 10	3

Herbicides generally need to be applied with an adjuvant. There are several types of adjuvants including surfactants, non-foaming agents, and colorants.

A surfactant, or surface-acting agent, is any compound added to an herbicide formulation or tank mix to facilitate and enhance the absorbing, emulsifying dispersing, spreading, sticking, wetting, or penetrating properties of herbicides. Surfactants are similar to detergents in their action, reducing water surface tension to allow wetting and penetration of the plant tissues. The surfactant helps to achieve optimum herbicide absorption onto the plant. Surfactants may also improve an herbicide's efficiency so that the concentration or total amount of herbicide required to achieve a given effect is reduced. This can reduce overall implementation costs, sometimes as much as five or ten-fold (Tu et al. 2001). In some cases, the herbicide would already have the surfactant included, but in other cases, it would be necessary to add one. This alternative designates a range of dilution rates for nonylphenol polyethoxylate (NPE) based surfactants of 0.25 to 2.5 percent and a typical dilution rate of one percent.

Defoamers are used to reduce the foaming that might occur during agitation of the spray mixture.

Colorants can be added to herbicide solutions to enable spray crews to see where they have sprayed after initial evaporation of the solution. This alternative would utilize Hi-Light Blue® dye or similar biodegradable colorant to facilitate visual control of application. This colorant is a water soluble dye and contains no listed hazardous chemicals. It is considered virtually non-toxic to humans (Bakke 2007).

Herbicide treatment would comply with local, state and federal pesticide laws and regulations including Forest Service policies, and would be applied strictly in accordance with the label directions (BMP 5-8). At a minimum, only certified personnel or those under the supervision of a certified applicator would be allowed to use restricted-use pesticides (FSM 2154.2; USFS 1994b). Table 4 summarizes the active ingredients, examples of brand names, properties, and general uses of the herbicides that are included as part of the proposed action. All herbicides considered under the

proposed action have human health and ecological risk assessments that are posted on the Forest Service website (http://www.fs.fed.us/foresthealth/pesticide/risk.shtml).

Table 4. Herbicides considered for use, including examples of trade names, and how they affect plants.

Active Ingredient, examples of brand names, action	Properties	General uses/known to be effective on:
Aminopyralid (e.g. Milestone®, Milestone VM®) Mimics natural plant hormones.	Selective systemic herbicide.	Use for annual, biennial, and perennial broadleaf species.
Chlorsulfuron (e.g. Telar® DF, Glean®, Corsair ™ Inhibits amino acid synthesis.	Absorbed by the leaves and translocated throughout the plant.	Use for broadleaf species and grasses.
Glyphosate (e.g. Accord®, Roundup®, Aquamaster®, Rodeo®) Inhibits 3 amino acids and protein synthesis.	A broad spectrum, non-selective, translocated herbicide. Translocates to roots and rhizomes of perennials. While considering non-selective, sensitivities do vary depending on species. Adheres to soil, which lessens or retards leaching or uptake by non-targets.	Most effective on perennial plants when applied in later summer and fall, when plants are entering dormancy (e.g. arundo). Some products have been approved for aquatic environments and can be used when surface water is present(e.g. Aquamaster®, Rodeo®).
Imazapyr **(**e.g. Aresenal®, Chopper®, Stalker®, Habitat®) Amino acid synthesis inhibitor.	Broad-spectrum, non-selective, pre- and post-emergent herbicide.* Most effective as a post-emergent. Low potential for leaching into ground water. Has low toxicity to invertebrates and is non-toxic to fish, mammals, and birds. It can damage non-target plants, by transfer between root networks.	Used for annual and perennial grasses, vines, brambles, and broadleaf species (e.g. tamarisk). Habitat® been approved for aquatic environments and can be used when surface water is present.
Triclopyr (e.g. Garlon®, Access®, Renovate 3®) Mimics the plant hormone auxin, causing uncontrolled plant growth.	Selective systemic herbicide.	Use to control woody and herbaceous broadleaf plants (e.g. tree-of-heaven). Has little or no impact on grasses. Product(s) has been approved for aquatic environments and can be used when surface water is present.

* Though imazapyr in general, can be used as a pre-emergent herbicides, this treatment method would not be used for Alternative 2. As noted earlier, no herbicide would be used as a pre-emergent.

Biological Control Treatment Method

Biological control (biocontrol) involves the reduction of pest populations through the use of natural enemies such as parasitoids, predators, pathogens, antagonists, or competitors to suppress pest populations. Biological control is a practical option for suppressing pest populations because it is target specific, it can be implemented as part of an Integrated Pest Management (IPM) program and once established, populations are self-sustaining. The goals of the using biological control agents are to prevent the establishment, slow the spread, and manage invasive species of significant environmental importance.

The following are steps are followed by Animal and Plant Health Inspection Service (APHIS) and California Department of Food and Agriculture (CDFA) prior to biocontrol release: 1) Accurate identification of the pest species and confirmation of the pest as a target for biological control, 2) Surveys for natural enemies (generally insects, mites, nematodes and diseases) are conducted in the area of origin of the pest (usually overseas), 3) Determine host-specificity of potential control organisms to assess impact on targets and nontargets and environmental safety, 4) Following approval from federal and state regulatory officials, biological control agents are shipped to a domestic quarantine facility where they are examined to confirm species identity and to determine whether they are free of parasites and diseases, 5) These agents are tested in field plots to determine that the agents do reduce densities of the target pest and do not have adverse effects on nontargets. Once this small scale testing is completed, appropriate natural enemies can be mass-reared to high numbers and released at field sites established by county biologists 6) Once released, each biological control agent is evaluated for establishment, spread, impact on the target species, and impact on nontarget species. Careful, long-term evaluation studies provide scientific data that are used to improve current and future programs. Additional releases may be made in an augmentative manner in systems where long-term stability of the natural enemies is not feasible. In addition, APHIS completes a NEPA analysis on all new biocontrol agents.

Specifically, at this time, the Proposed Action involves the potential use of one insect species as a biocontrol agent, *Eustenopus villosus,* or hairy weevil, which is the only species APHIS has completed a NEPA document for. This insect species will only be used for biocontrol of yellow star thistle (YST). YST has become one of California's worst pests. The hairy weevil has been found to be effective in controlling YST. Hairy weevil was released in the late 1999 to early 2000 throughout Ventura and LA County by CDFA.

Yellow star thistle is currently found primarily along Interstate 5 Highway. It is also found scattered in adjacent tributaries and up to the ridgetops throughout the I-5 corridor. It is expected that it will spread to all tributaries, riparian and ridgetop areas. Yellow star thistle can cover thousands of continuous acres if it is not treated and removed. In areas where biocontrol would be used, 200 to 300 insect adults will be released at a time. The intention is to inoculate a YST population and then slowly over a few years the insects will become established. The release will most likely be in an area that is both well established with YST and hard to access due to slope, remote location etc. These areas are harder to treat with other methods. It is also important to note that biocontrol agents will not remove 100% of a YST population. They are effective between 40% to 90%. Additional treatment methods will be required to achieve 100% eradication.

Release of biological control agents are not planned in the Magic Mountain Wilderness at this time. If insects for control of Yellow star thistle, or any other biological control agent, are later determined to be needed, it will require minimum tools analysis and Regional Forester approval of the biological control agent.

Treatment Areas

For analysis, planning and reporting purposes, the project area has been divided into 18 subwatersheds (Figure 3 and 4) and maximum annual treatment acres and miles by subwatershed have been included in the project design. Table 5 shows these subwatersheds and the total miles and acres in each. The proposed action would cap the maximum annual treatment of the invasive plant species populations and future expansions of these species as shown in table 5, depending on funding, Forest priorities and staffing.

Table 5. Stream miles and acres by watershed.

Watershed Name	Total Acres	Total Stream Miles	Maximum Treatment Acres/Miles/Yr.
Santa Clara Drainage			
Aliso Canyon	19,668	50	500/5
Bouquet Canyon	34,000	100	500/10
Canada De Los Alamos	5,208	13	500/5
Castaic Lake	7,431	25	500/5
Elizabeth Lake Canyon	33,409	94	500/10
Fish Canyon Creek	17,363	62	500/5
Lake Piru	7,577	18	500/5
Lower Castaic Creek	6,193	18	500/5
Lower Soledad Canyon	15,086	40	500/5
Mint Canyon	9,786	29	500/5
Piru Creek/Fish Creek	8,926	23	500/5
Piru Creek/Snowy Creek	432	2	432/2
Placerita Creek	4,411	10	500/5
Pyramid Lake	15,414	47	500/5
San Francisquito	26,792	81	500/10
Soledad Canyon-Arrastre	6,510	14	500/5
Upper Castaic Creek	24,075	87	500/10
Upper Santa Clara River	10,956	26	500/5
TOTAL	**253,237 acres**	**739 miles**	

It is anticipated 95 percent of the treatment acres would need reentry for additional treatment annually until the invasive plant species are eradicated, controlled, contained, or suppressed. Depending on the method (e.g. “cut, resprout, and spray,” manual/mechanical) treatments could require two entries or more in any given year. Based on the priority species listed in Table 1, it is assumed, with the successful treatment of the invasive plants, the maximum annual treatment acres would decrease over the life of the project, depending on funding.

Most of the miles and acres in these watersheds have widely scattered high priority invasives. Only a few areas such as lower San Francisquito and Bouquet Canyon and the I-5 corridor have higher densities. Priority for treatment will be based on native species and ecosystems at greatest risk, significance of hazardous fuels buildup, aggressiveness of the invasive infestation, and the threat to downstream and adjacent landowners from not doing treatment. Budget and partnership opportunities will also affect priorities and implementation schedules.

Figure 3. Subwatersheds West.

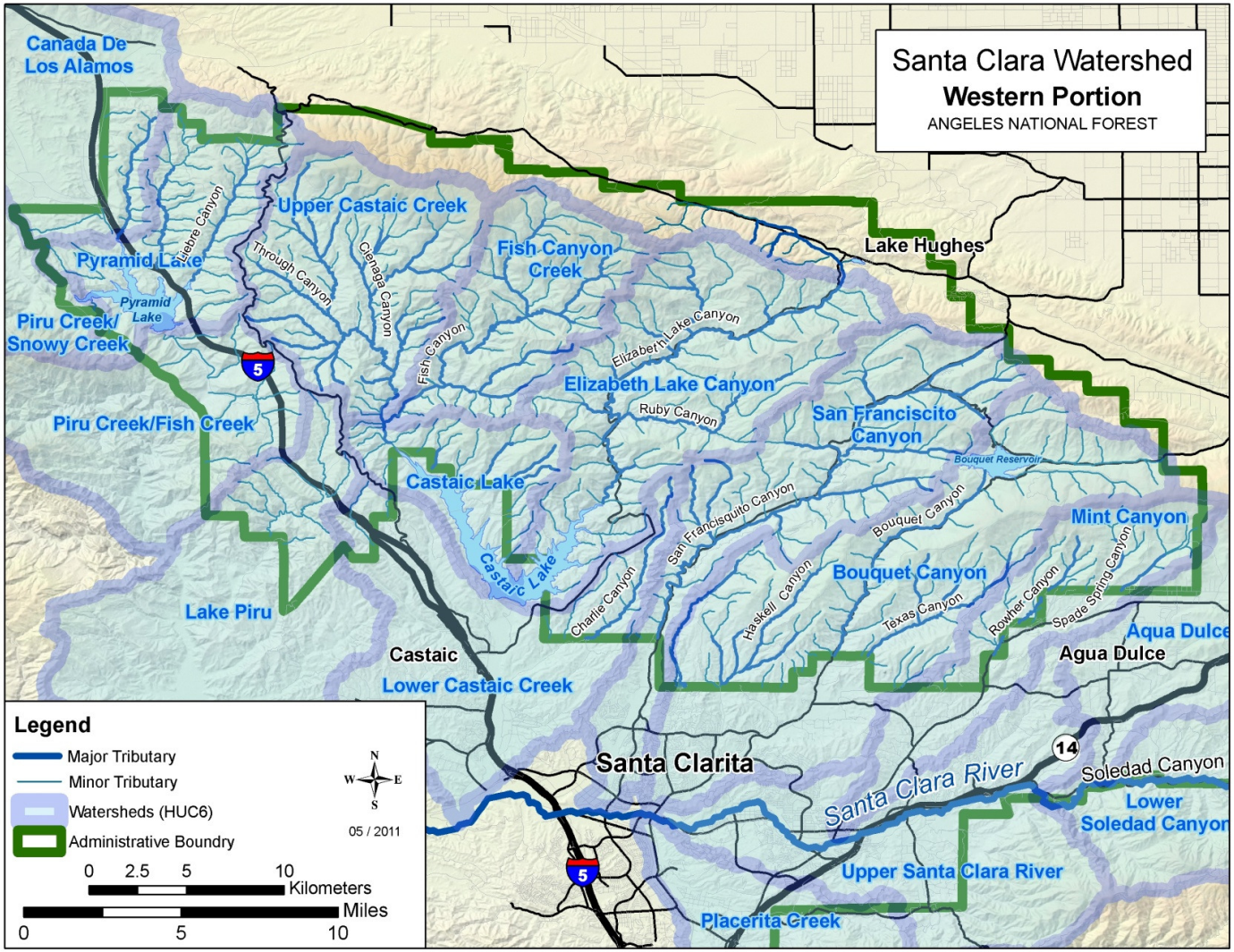
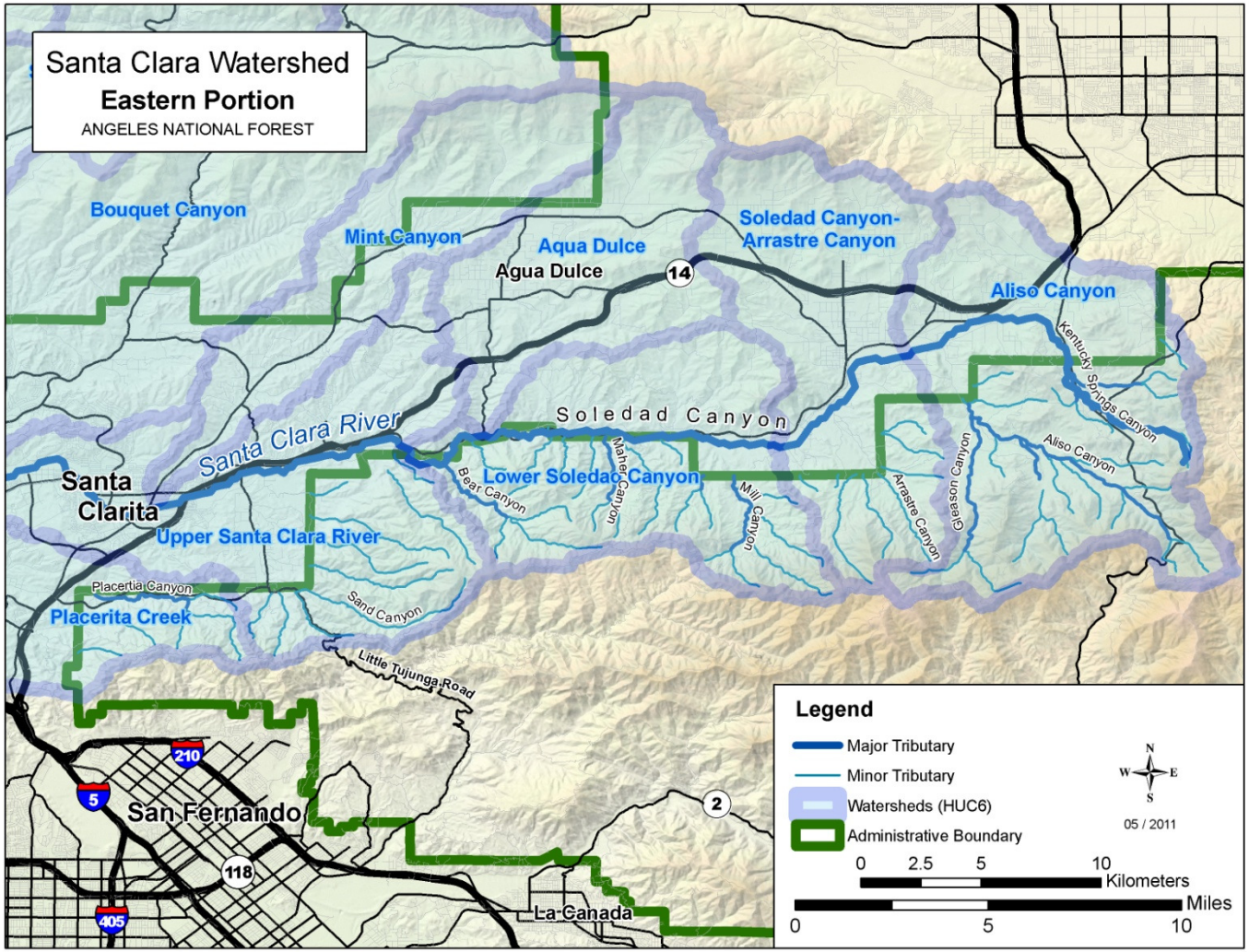


Figure 4. Subwatersheds. East



Restoration

To ensure treated areas are not re-established with invasive plant species, restoration activities may be required. Restoration is a critical component to invasive weed management (Masters et al. 1996, Masters and Shelly 2001, Brooks et al. 2004). Treatment areas with gaps and bare soil would be open and vulnerable to re-colonization of the same or other invasive plant species with no additional work. In addition, invasive plant removal on steep slopes without native species recovery or restoration could decrease slope stability.

Where invasive plant treatment occurs in the high water areas along the drainages, it is unlikely active restoration work would be required. Riparian vegetation, when given an opportunity, appears to re-establish in these areas without any additional work. Areas where flood waters have been eliminated or do not exist, or where receding flood flows do not occur when short-lived riparian plant seed are produced, active restoration may be necessary. This could include seeding (with local native weed-free seed), planting (where the native plant seed or cuttings would be collected from a local source), and/or mulching (with weed-free material). Minimal site preparation would be expected (e.g. with seeding, use of a hand rake or similar tool would be used). Weed-free straw or other mulching may be applied. Any live vegetation would be planted with hand tools.

Restoration Strategies Considered

There are three major strategies for restoration of sites after treating invasive plant species (Polster 2004):

1. Successional advancement or assisted succession: This is a strategy where later successional species are planted (e.g. conifers, oaks, shrubs) to develop an adequate canopy cover to reduce light resources for invasive species and would likely require planting containerized plants or cuttings. This strategy is not likely to be successful with species like tree-of-heaven, English ivy and bigleaf periwinkle which are tolerant of shadier environments.
2. Modifying disturbance regimes: This strategy modifies disturbance regimes, where the existing disturbance regime may be facilitating perpetuation of a specific species. This strategy could be useful with species like tamarisk which is observed in large numbers around reservoirs. Changing the flooding frequency may be enough of a change in disturbance regimes to eliminate it. This strategy is considered but changing the flooding frequency is dependent on outside agencies and may not be feasible.
3. Encouraging competition: The strategy is when desired native species are encouraged, through seeding, planting, or repeated treatment of an invasive plant species, the native seedbank or species already present will outcompete the invasive plant population. Seeding or planting desired native species is more successful in sites that have high levels of disturbance, and have little native cover remaining. Repeated removal of invasives at sites that still have a native component can facilitate release of the native seedbank or suppressed native plants.

The decision on which restoration strategy would be used on a given site would be dependent on site specific conditions (e.g. the location, size of area treated, invasive plant species treated). Monitoring would occur whether the restoration is active or passive and modifications made as needed. A Project Restoration Plan, dated June 2013, contains further details and is included in the project record, and is hereby incorporated by reference.

Monitoring

Monitoring is an important aspect of Integrated Weed Management. Annual monitoring reports would be completed for the treatment sites (e.g. location [using a GPS], size of treatment area, method of treatment, season of treatment, and if herbicides were used, the name of the herbicide and the amount used in that treatment site). Treated sites would be reviewed annually to determine if re-treatment

and/or restoration activities would be necessary. The individual monitoring reports for newly found populations of invasive plant species that are classified as undesirable, noxious, harmful, injurious, or poisonous would be completed on the Natural Resource Information System (NRIS) Noxious Weed Inventory Form or modified to meet national monitoring data needs.

Monitoring would occur in sensitive environments (e.g. threatened, endangered and/or Forest Service sensitive species habitat, heritage resource sites) during herbicide applications or other treatment methods in order to detect and evaluate unanticipated effects (FSM 2150; USFS 1994b).

All surveys and monitoring would be documented in the project files and in the NRIS database. There would be two main types of monitoring: implementation monitoring and effectiveness monitoring. Purposes for monitoring include, but are not limited to, determine the effectiveness of treatment, quickly treat new populations, monitor and possibly provide adaptive management based on unanticipated effects, and monitor the restoration of treated sites. As noted earlier, all monitoring would compliment data already compiled for FACTS and NRIS databases. A Project Monitoring Plan, dated June 2013, contains further details and is included in the project record, and is hereby incorporated by reference. Monitoring results would be made available to interested publics. The monitoring plan would be updated and revised through the annual invasive species management implementation review process.

Access

No new permanent (classified or System) or temporary (unclassified or non-System) roads are being proposed with this action. Any access would generally be by foot, or by vehicles using existing roads and trails. Helicopters and ATV (quads) may be used for transportation in remote areas where access is difficult with approval of the District Ranger. Helicopters may be used wilderness to ferry tools and equipment needed to conduct essential invasive removal projects if approved in a minimum tools analysis for the specific treatment.

Alternative 3, No Herbicides

Alternative 3 was developed in response to several comments received during scoping. One group was concerned that herbicides could have unknown adverse effect on aquatic organisms, humans, and animals in general, and does not want the Forest to use herbicides. Forest Service biologists also expressed concerns, especially in relation to CA red-legged frog. In addition, it is known by the Forest tribal relations program manager that some Native American traditionalists generally do not like the use of herbicides on National Forest lands because of potential damage to traditional use plants. Other groups and individuals expressed the concern that without the use of herbicides, the war on invasive plants could not be won. The alternative is being considered in detail because it is a reasonable alternative to the proposed action, could potentially fulfill the purpose and need (dependent on staffing and funding), and addresses some concerns related to the proposed action. This alternative would be similar to Alternative 2, Proposed Action, but would remove herbicides as an option from the treatment methods.

More emphasis would be placed on using hand pulling and mechanical tools (e.g. hand pullers, chainsaws, girdling). The number of entries into the same area would vary by invasive plant species but multiple entries would generally be required. The most difficult invasive plant species to treat without herbicides would likely be the larger sized arundo, tamarisk and pockets of tree-of-heaven, and return treatments could be for the life of the project and beyond. Some species would likely need multiple treatments in one growing season for the larger sized invasive plants that have large root/rhizome structures (e.g. arundo, tree-of-heaven, Himalayan blackberry). The number of entries in one growing season would depend on the size of the root/rhizome structures with the intent of weakening the plants root/rhizome structure to cause eventual death. Some invasive plant areas would likely need to be treated annually and the species would not likely be eradicated (e.g. ivy). This

alternative would likely result in the control rather than eradication of invasive plant species in the project area. This alternative would require more monitoring and restoration activities than alternative 2. There would be a considerable amount of ground disturbance associated with this alternative due to the number of re-entries and difficulty of control of priority species. Areas that were not highest priority would potentially not be treated due to high cost and lack of manpower.

The Draft Monitoring Plan in the Project File was designed for alternative 2 and would not be finalized until the decision. Should the decision be to implement alternative 3, this plan would be modified appropriately.

Alternative 2 and 3 Design Features

The following design features (protection/mitigation measures) were designed to reduce potential adverse affects from the action alternatives. This section displays those that are specific to alternative 2 (i.e., specific to the use of herbicides) and those that would be applicable for both action alternatives (alternatives 2 and 3), except where noted.

Alternative 2 Design Features (specific to herbicide use)

General

1. The Herbicide Transportation, Handling, and Emergency Spill Response Plan and spill kit will be on-site when herbicide treatment methods occur. This Plan will include reporting procedures, project safety planning, methods of clean-up of accidental spills, and information including a spill kit contents and location as noted in Forest Service Manual (FSM) 2150 (USFS 1994b), Pesticide-Use Management and Coordination and Handbook (FSH) 2109.14, and Pesticide-Use Management and Coordination Handbook (USFS 1994a). At a minimum, the Plan will include:

a) No more than daily use quantities of herbicides will be transported to the project site. The exception is for crews staging in remote locations in wilderness areas. Under these circumstances, they can bring sufficient quantities of herbicides to last for the planned duration of the field work (i.e., multiple days).

b) Equipment used for transportation, storage, or application of herbicides will be maintained in a leak-proof condition.

c) Herbicide containers must be secured and prevented from tipping during transport.

d) To reduce the potential for spills, impervious material, such as a bucket or plastic, will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling.

e) No herbicide application will occur if precipitation is occurring or is imminent within 24 hours or as required by the label. In uplands, immediately upslope of occupied or critical unarmored threespine stickleback, arroyo toad and red-legged frog habitat, this restriction is increased to 48 hours for use of triclopyr BEE formulations.

f) Immediate control, containment, and cleanup of fluids and herbicides due to spills or equipment failure (broken hose, punctured tank, etc.) will be implemented. All contaminated materials will be disposed of promptly and properly to prevent contamination of the site. All hazardous spills will be reported immediately to the Forest Hazardous Spill Coordinator.

g) Herbicide spray equipment will not be washed or rinsed within 150 feet of any body of water or stream channel. All herbicide containers and rinse water will be disposed of in a manner that would not cause contamination of waters (Best Management Practices [BMP] 5-11[3]).

[3] Best Management Practices
http://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5352584

h) Mixing and loading of herbicide(s) will take place a minimum of 150 feet away from any body of water or stream channel unless prior approval is obtained from a Forest Service hydrologist or biologist in special cases where it is more safe.

i) Wellhead Protection[4]

a) Except as provided in subsection (b), the following activities shall be prohibited within 100 feet of a well (including domestic, municipal, agricultural, dry, monitoring, or abandoned wells):

1. mixing, loading, and storage of pesticides.
2. rinsing of spray equipment or pesticide containers.
3. maintenance of spray equipment that could result in spillage of pesticide residues on the soil.
4. application of preemergent herbicides.

b) Wells shall not be subject to the requirements in (a) if they are:

1. sited so that runoff water from irrigation or rainfall does not move from the perimeter of the wellhead toward the wellhead and contact or collect around any part of the wellhead including the concrete pad or foundation; or
2. protected by a berm constructed of any material sufficient to prevents movement of surface runoff water from the perimeter of the wellhead to the wellhead.

(c) Application of pre-emergent herbicides shall be prohibited between the berm and the wellhead (None are being proposed).

2. If foliar/spot spraying application is required, the following techniques will be used to minimize drift (BMP 5-13):

a) Label directions regarding wind speed and temperature will be followed.

b) Within 25 feet of occupied or Critical Habitat for unarmored threespine stickleback, red-legged frog, or arroyo toad habitat, herbicides will not be sprayed when winds are greater than ***5*** miles per hour (mph) if label instructions do not address wind speed or allow application during higher wind velocities. In all other areas, spray applications up to 10 mph is acceptable as long as this is consistent with label directions.

c) Within Riparian Conservation Areas, herbicides will only be sprayed in a downward direction. If target plants are taller than three feet, the plants will be laid down and sprayed (bend and spray).

3. Only the aquatically labeled formulations of glyphosate, imazapyr, and triclopyr (e.g. Habitat,® Aquamaster,® Renovate 3®) and low-risk aquatically approved surfactants (e.g. Agri-Dex®, Class Act® NG®, Dyne-Amic®, Competitor®)[5] will be allowed within 100 feet of the banks of ponds, flowing rivers and tributaries. The surfactant polyethoxylated tallow amine or polyoxyethyleneamine (POEA) cannot be used in this buffer. Chlorsulfuron can only be used beyond 25 feet from a water body or flowing stream edge to protect aquatic plants. Aminopyralid has no restriction in the 100- foot buffer as long as treatment is completed outside of the unarmored threespine stickleback, arroyo toad, and red-legged frog spawning or breeding season and other design features are followed.

[4] California Code of Regulations (Title 3. Food and Agriculture) Division 6. Pesticides and Pest Control Operations

[5] R-11 surfactant has a higher risk of adversely affecting aquatic wildlife species.

Due to the potential for impacts to aquatic species, Triclopyr BEE (eg. Garlon 4®) will not be used in the floodplain[6] of any intermittent or perennial stream.

Worker and Public Safety

4. Maintain a safety plan specific to this project that includes a job hazard analysis, including personal protective equipment/clothing (PPE) needs (FSH 6709.11; USFS 1999) and addresses risk and standard cleanup procedures (Forest Plan, part 2, p. 106; FSM 2153.3 [USFS 1994b]; FSH 2109.14,16 [USFS 1994b]).
5. Recently herbicide treated areas should not be reentered, at a minimum, until the herbicide has dried. If the herbicide label specifies a reentry period or restricted entry interval, treated areas must be posted with signs warning visitors and others not to enter the treated area. The signs should indicate that the area has been treated with an herbicide, what materials were used, and the name and telephone number of a contact person.
6. In areas in which members of the general public might consume vegetation/fruit where herbicides are intended to be used, the edible vegetation/fruit will be cut prior to being treated with herbicide. The intent is to reduce the risk of the public consuming herbicide treated vegetation/fruit.
7. Triclopyr TEA formulation (e.g. Garlon 3®), will only be used in cases where there is no other approved herbicide that has been shown to be effective and efficient in treating a specific invasive plant species.
8. In treatment areas with Special Use permittees permitted to raise bees for honey, permittees will be notified in advance of any herbicide treatment so bees can be moved or covered if the permittee desires.

Biological Resources

Special Status Plant Species (Federally Listed Threatened, Endangered, Proposed, Candidate Species and Forest Service Sensitive Species)

9. If a new federal threatened, endangered, proposed or candidate plant location is found during pre-project surveys or while the project is being implemented, the US Fish and Wildlife Service (USFWS) will be notified. If the proposed treatment will affect listed species, consultation will be initiated immediately. Until consultation is complete, no foliar or spot spraying will be allowed within 100 feet of the occurrence; non-foliar and non-spot herbicide treatments (e.g. hack and squirt, cut stump, etc.) will be allowed no closer than 25 feet of these species. These buffers will remain in effect until consultation with the US Fish and Wildlife Service is completed and the final treatment prescription is developed.
10. All Forest Service sensitive plants will have a 5 to 70-foot buffer. The buffer size will be determined based on: (1) phenology at time of treatment; (2) rareness and imperilment of species; (3) vulnerability to herbicide being used; (4) the concentration of herbicide; and/or (5) environmental conditions and terrain. Prior to project implementation, the District Resources Officer, with input from specialists, will review all information, including any new information, and develop buffers that will minimize effect to Forest Service sensitive plant species to negligible or minor.
11. Nevin's barberry is known to occur in San Francisquito Canyon, within the project area. In some areas, tamarisk (Tamarix sp.) is growing intermixed with Nevin's barberry individuals. In this case, manual removal and cut/stump with glyphosate are the only options. For manual removal, tamarisk must be cut at the base as close to the soil level as

[6]A floodplain is flat or nearly flat land adjacent to a stream or rier that experiences occasional or periodic flooding.

possible. For best results, this cutting should happen every three months. Cut/stump glyphosate treatment is the only herbicide treatment that can be used within 100 feet of a Nevin's barberry.

Special Status Wildlife Species (Threatened, Endangered, Proposed, Candidate and Forest Service Sensitive)

12. In unarmored threespine stickleback, arroyo toad, or red-legged frog occupied or critical habitat**:**
   a) Herbicide treatment within 100 feet of the streambank will not be allowed during the typical spawning/breeding period[7]. This restriction period may increase if spawning is observed earlier or later in the season for these three species.
   b) In no case, shall herbicide drift be allowed to enter adjacent waters in these areas.
   c) At all times in occupied/critical habitat, glyphosate (e.g. Aquamaster®) and triclopyr TEA (e.g. Renovate 3®) application rates will not exceed ***3*** pounds a.e. per acre within 100 feet of the stream if surface water is present.
   d) Use of Triclopyr BEE formulation in upland areas will only be allowed if it is greater than 150 feet from occupied/critical habitat.
   e) In uplands directly upslope of occupied/critical habitat, where runoff would be delivered directly to the stream, no triclopyr BEE application will occur during the spawning season or (as noted in design feature 1e) if precipitation is occurring or imminent within 48 hours.
   f) Six pounds a.e. of triclopyr BEE formulation per acre is the maximum amount that can be used in foliar and spot spray applications in uplands adjacent to these species occupied or critical habitat.
   h) During herbicide application in these occupied or critical habitats, applicators will not be allowed to make multiple stream crossings for the purpose of treating both streambanks simultaneously. For example, during a work period, an individual should conduct treatments along one streambank for the entire stretch before initiating treatments on the opposing bank.

Water Resources

13. Appropriate Best Management Practices (BMPs) will be followed to reduce or prevent negative impacts to non-target resources. BMPs for this project include the following in addition to previously mentioned BMPs:
   a) Every effort will be made to prevent herbicide(s) from being introduced into water. To accomplish this, herbicides will only be sprayed in a downward direction in riparian areas. If target plants are taller than three feet, the plants will be laid down and sprayed (bend and spray). Herbicide applicator must be able to stand on dry ground between the water edge and plants to be sprayed and spray must be directed away from the water. A coarse spray will be used to target individual invasive plants and reduce drift.
   b) Herbicide usage will be limited to minimum amount required to be effective.
   c) Herbicides will be applied according to label directions and applicable legal requirements (PRACTICE: 5-8).

[7] Breeding/spawning season. Arroyo toad (Feb-August), Ca. Red-legged frog (Nov.-April), Unarmored threespine stickleback (April-July)

d) Herbicide application will be monitored and evaluated (See Monitoring Plan) (PRACTICE: 5-9).
e) Pesticide Spill Contingency Planning (BMP PRACTICE 5-10). (See Design Feature 1).
f) Cleaning and Disposal of Pesticide Containers and Equipment (PRACTICE 5-11). (See Design Feature 1).
g) Streamside Wet Area Protection During Pesticide Spraying (PRACTICE: 5-12). (See proceeding Design Features).
h) Controlling Pesticide Drift during Spray Application (PRACTICE: 5-13). (See proceeding Design Features).

Wilderness Areas

14. Prior to any herbicide use in wilderness, a Pesticide Use Request will be submitted to the Regional Forester for approval. Treatment using herbicides will not be conducted until approved.

Alternatives 2 and 3 Design Features (Non-Herbicide Methods)

Design features were developed to decrease potential adverse impacts either action alternative (Alternative 2, Proposed Action and Alternative 3, No Herbicides) may cause. The design features are applicable to either of the action alternatives (unless noted).

General

15. Ground disturbance will be limited to the absolute minimum necessary for effective treatments (Forest Plan, part 2, p. 100; USFS 2005).
16. An annual pre-operations briefing will be required prior to treatment between the project manager and personnel implementing the project. Additional staff will be invited such as District Ranger, Botanist, District Biologist, Forest Archeologist, District Recreation Officer and District Resource Officer. The briefing will include a review of sensitive resource locations, the identification characteristics of sensitive resources that could be found in the project area, and all operational details (including safety issues, locations, timing, treatment methods, herbicides approved for use [for alternative 2], law enforcement coordination needs, awareness of other project activities in the area, wilderness rules [e.g. Forest Plan, ANF S2, part 2, p. 79], etc.). For alternative 2, protective measures (e.g. use of personal protective equipment, proper worker hygiene practices, proper handling of the herbicide, safety protocol in the event of a hazardous spill will be emphasized with the use of all herbicides, especially for woman of child bearing age. If triclopyr is used, there will be an additional discussion on toxicity. Additional briefings will occur throughout the implementation period to ensure the treatments comply with the project design. Notes from the meeting(s) may be kept in the project file.
17. Where feasible, select existing hardened surfaces or disturbed sites for staging areas. Just prior to treatment, mark points of access, parking, and treatment areas in resource sensitive areas with signs, staking, and flagging to keep project activities confined to designated areas. Advise all project personnel to conduct work activities within the defined work area only in these resource sensitive areas.
18. To maintain water quality, small quantities (5 gallons or less) of fuel for gas-powered machinery will not occur within 25 feet of any body of water or stream channel. All other fueling must occur at a minimum of 150 feet from any body of water or stream channel unless prior-approved by a Forest Service hydrologist or biologist.

Biological Resources

Special Status Wildlife and Plant Species

19. Prior to treatment, focused plant surveys will be conducted to determine presence or absence of specially listed plant species in the treatment area. Surveys will be conducted during a season when they are identifiable. For annual and geophytic[8] plant species, surveys will be conducted following a season with adequate precipitation to stimulate germination/flowering. Specifically for federally listed plant species, protocol[9] level plant surveys, as agreed to with the Fish and Wildlife Service, will be conducted. If any Forest Service sensitive plant species are present, protective measures may include, but are not limited to the following: (a) flag and avoid; (b) relocation; (c) seasonal restrictions; or (d) treatment methods will be designed to avoid negative impacts.

    Similar to design feature 9, if any federally listed plant species are found in a proposed treatment area and there is potential for effects to the species, consultation with US Fish and Wildlife Service (USFWS) will be initiated immediately. If federally listed plant species are found before or during implementation, a buffer of 100 feet for herbicides and 25 feet for non-herbicide treatment will be placed around the plants. The intent of this buffer is only to provide temporary guidance for workers in the field until USFWS consultation is completed. This is not meant to be a permanent buffer. It is meant to facilitate continued field work until appropriate measures are taken.

20. Nevin's barberry is known to occur in San Francisquito Canyon, within the project area. In some areas, tamarisk (Tamarix sp.) is growing intermixed with Nevin's barberry individuals. In this case, manual removal and cut/stump with glyphosate are the only options. For manual removal, tamarisk must be cut at the base as close to the soil level as possible. For best results, this cutting should happen every three months.

21. If any unanticipated Forest Service sensitive plant species are observed in the project area during implementation, work in the area should stop within 70 feet of the plant population and the District Resources Officer or designee should be notified immediately to determine appropriate action.
22. Biological control agents will not be allowed if they are known to target the genus of any special status plant species.
23. If invasive plant treatments are conducted within special status plant locations, the District Resources Officer or designee will be notified. If necessary, a botanist or designee may be present during treatment.
24. Any restoration conducted in areas with known federally listed (threatened, endangered, proposed and candidate species) or Forest Service sensitive plant occurrences will avoid direct impacts to individuals.
25. No greater than two years prior to the time of treatment, habitat surveys will be conducted by a qualified wildlife biologist to determine whether habitat for threatened, endangered or sensitive wildlife species is present in the treatment area. If suitable habitat is found,

[8] A geophyte is an herbaceous plant with an underground storage organ. Storage organs are reserves of carbohydrates, nutrients, and water, and may be classified as bulbs, corms, tubers, rhizomes, tuberous roots, and enlarged hypocotyls.

[9] Copy of this protocol direction can be found in the project planning record located at the Santa Clara/Mojave River Ranger District office.

protective measures may include, but are not limited to, the following: flag and avoid; seasonal restrictions; or treatment methods will be designed to avoid or minimize negative impacts.

26. If suitable southwestern willow flycatcher or least Bell's vireo habitat is located in a project area, the suitable habitat will be excluded from treatment (including restoration activities) during the breeding season (March 15 to September 15 for the least Bell's Vireo and May 1 to August 31 for the southwestern willow flycatcher) unless USFWS protocol surveys have been conducted that year with negative results. If chainsaws or other noisy mechanical equipment is used during the breeding season, include a 500-foot buffer from suitable habitat or restrict activities to two hours or less within 500 feet of suitable habitat. This restriction is waived if USFWS protocol surveys have been conducted with negative results. Additionally, in areas where tamarisk is present and contributes to the suitability of nesting habitat for the southwestern willow flycatcher, treatments of these tamarisk occurrences will not result in a net reduction of more than 20 percent of the suitable habitat within the project area annually, unless USFWS protocol surveys have been conducted that year with negative results.
27. In areas that are known to be occupied by UTS, red-legged frogs or arroyo toad, treatment of boots and equipment prior to entry into the area will be required to reduce the spread of chytrid fungus and other water-borne problems. Treatment of boots and equipment would be cleaning with a 10 percent bleach solution (or another generally accepted technique) and completely drying the equipment/boots before use in another unconnected water body (the Declining Amphibian Populations Task Force Fieldwork Code of Practice).
28. Mechanical/manual treatments (including restoration activities) are permitted year-round in occupied and critical habitat for UTS, arroyo toad, and red-legged frog. However, during the spawning/breeding season, project personnel will avoid entering the stream, except for necessary crossings to access treatment areas (also review design feature 10h). In addition, emergent and streambank vegetation will not be removed by any means during the spawning/breeding season.
29. The occurrence of federally listed (threatened, endangered, proposed and/or candidate) species that had not been identified and consulted with US Fish and Wildlife Service (USFWS) earlier, will require additional analysis, and consultation with USFWS will be reinitiated if appropriate.
30. Conduct on-site environmental training as needed to aid workers in recognizing and avoiding special status species that may occur in the project area.
31. In the event of a plant and/or wildlife species protection status changing to threatened, endangered, or Forest Service sensitive, additional analysis will be completed to determine potential impacts. Reinitiating US Fish and Wildlife Service consultation will occur, if applicable.
32. Avoid establishing staging areas or base camps within threatened, endangered, and/or Forest Service sensitive species suitable or occupied habitats and riparian areas.

Invasive Plant Species

33. To reduce seed spread, disposal of invasive plants removed will be as follows: If flowers or seeds are present and have the potential for the seed to be widely dispersed during treatment (e.g. Spanish broom, eupatory), remove the flowering head and place in container. Then treat and if necessary remove the plant, and place in an appropriate container for disposal.

34. Areas with bare soil, created by the treatment of invasive plants, will be evaluated for restoration to prevent further infestations by the same or new invasive plant(s) as noted in the restoration plan. Whenever possible, protect non-target vegetation in order to minimize the creation of exposed ground and the potential for re-colonization of invasive plants. The District Resources Officer will be consulted prior to any restoration implementation.
35. Vehicles and all equipment must be washed before entering project sites. Should vehicles travel through or park in invasive plant infestations, the vehicle must be washed for a minimum of six minutes (USFS 2008) before entering the project area (e.g. at a car wash with the undercarriage option). This includes wheels, undercarriages, bumpers and all parts of the vehicle. Equipment must have all vegetation and seeds removed prior to entering and exiting project site (i.e., all tools such as chain saws, hand clippers, pruners, etc must be visually inspected before entering and leaving all project sites) or placed in an enclosed area (e.g. back of an enclosed truck or a bag) and cleaned off-project site. All cleaning must take place where rinse water is collected and disposed of in either a sanitary sewer or a landfill.

The field project manager will keep written logs: When vehicles and equipment are washed/cleaned, a daily log must be kept stating:

- Location
- Date and time
- Methods used
- Staff present
- Equipment washed
- Signature of responsible crew member

These written logs will be turned in to the District Resources Officer or a designee on a weekly basis.

36. Certified weed-free mulches and local weed-free seed sources will be used in restoration or soil stabilization efforts (Forest Plan S6, part 3, p. 5; USFS 2005).
37. Efforts will be made to insure that seeds and/or vegetative propagules[10] of invasive plants will be removed from clothing and equipment prior to leaving treatment sites.
38. Transport of removed invasive plants with seeds or vegetative propagules will occur in enclosed disposal containers or in an enclosed vehicle.
39. Invasive plants to be disposed of off-site will be taken to a facility (i.e., landfill) that contains the disposed items.
40. If burning of removed invasive plants occurs, burn pile sites will be monitored the following year to assess potential needs for revegetation or additional invasive plant removal treatments.
41. All staging, parking, and burn pile areas will be located outside of noxious plant occurrences.
42. Where appropriate, barriers will be installed to limit illegal OHV activity after treatment is complete. Examples of barriers are large rocks, soil berms, and cut vegetation.

Wildlife Species

43. All trash generated from this project will be collected and properly disposed of on a daily basis. Upon completion of the project, all unused material and equipment shall be removed from the site.

[10] A propagule is a structure (as a cutting, a seed, or a spore) that reproduces a plant sexually or asexually.

44. To avoid attracting opportunistic predators, such as black bear, coyotes, domestic and feral dogs and cats, opossums, skunks, and raccoons, all food and trash must be appropriately stored in closed containers and removed from the project site at the end of each day.
45. Avoid adverse impacts to nesting birds per Migratory Bird Treaty Act (MBTA), by avoiding treatment activities during bird breeding season (March 15 to September 15) whenever practicable. If work is performed during the breeding season, applicators and other project personnel will watch for nests and disturbed nesting birds. If active nests are located, any work should be completed quickly near the nest to reduce disturbance.
46. In sensitive amphibian areas, vehicles and equipment will be parked or removed from the habitat before sunset.
47. Whenever possible, vegetation piled on site for later removal or burning should be treated as soon as possible after piling in order to minimize colonization by wildlife. Prior to removing or burning brush piles, disturb the piles of brush and pull them apart slightly to encourage animals to move out of the piles (e.g. salamanders, lizards, small mammals). Depending on the plant species, some of the cut vegetation could be used as vertical mulch to minimize illegal off-highway vehicle (OHV) activity.
48. Protect known active or inactive raptor nest areas from project activities. A no-disturbance buffer around active nest sites will be required from nest-site selection to fledging (Forest Plan S18, part 3, p. 7; USFS 2005).
49. Pets shall not be allowed on-site during treatment.

Water Resources

50. Appropriate Best Management Practices (BMPs) will be followed throughout the project to reduce or prevent negative impacts to non-target resources. BMPs include the following:
    a) Hand crews will stay out of flowing or ponded water whenever possible.
    b) If hand removal of invasive plants requires entry into flowing or ponded water, keep the time in the water to a minimum.
    c) Revegetation of Surface Disturbed Areas (PRACTICE: 5-4).
51. If multiple, unconnected streams or springs are being walked or worked in by implementation crews on the same day, treatment of boots and equipment prior to entry into the new area will be required to reduce the spread of chytrid fungus and other water-borne problems. Treatment of boots and equipment would consist of cleaning with a 10 percent bleach solution (or another accepted technique). Avoid cleaning equipment in the immediate vicinity of a pond, wetland, or riparian area. (Declining Amphibian Task Force Code of Practice).

Wilderness Areas

52. An analysis of the effects and approval by the Regional Forester will be required for any use of biological control agents in the Magic Mountain or any future wilderness.
53. Prior to any use of motorized equipment in wilderness, including weed trimmers, chainsaws and helicopters, a minimum tools analysis will be conducted and approved by the District Ranger if it is determined to be the minimum tool needed to maintain wilderness values.
54. District Ranger or Forest Supervisor will approve appropriate locations for temporary remote base camps and helicopter drop-off and haul sites in the wilderness, if necessary, to facilitate invasive plant removal or treatment. Locations will be based upon concentrations of invasive plants, public use, natural resources and wilderness resource concerns.

55. Operation of work crews and equipment will be limited to weekdays (Monday-Friday) and non-holidays during daylight hours. Avoid other heavy use periods, such as spring breaks.
56. The Wilderness Ranger will be periodically consulted during the implementation of this project and will be adequately informed about the approved treatment actions. The Wilderness Ranger, in part, will serve as an observer, educator, and monitor for the implementation project manager.

Recreation Resource

57. Within areas of concentrated public use and developed recreation sites, implementation of this project will be limited to weekdays and non-holidays during daylight hours. Avoid other heavy use periods such as spring and summer school breaks.
58. Chipping activities will be located at least 500 feet from established recreation facilities during heavy use times such as weekends and holidays. The District Ranger or recreation staff will determine appropriate locations of chipping sites within areas of concentrated public use.
59. Motorized equipment will be equipped with appropriate mufflers and spark arrestors in good working condition to minimize noise levels and fire risks.
60. Temporary public use closures are permitted in areas where the public and workers commingle and public safety is compromised because of operating equipment, hand tools, and/or, with alternative 2, the herbicide label requires it. The District Ranger will monitor potential conflicts and act accordingly.
61. In advance of initiating treatment work, interpretive signing will be placed in developed recreation sites and areas of concentrated public use. Interpretation will be presented in English and Spanish and will focus on the purpose, need, and the environmental benefits of invasive plant treatments. For alternative 2 (proposed action), if herbicides are included as part of the treatment, a list of the herbicides to be used, treatment dates, and name and phone number of Forest contact will be provided at appropriate sites, a minimum of one week in advance of herbicide treatment, along with other access points to these treatment areas and appropriate Forest offices.
62. Staging areas for equipment and crew congregation will be located in areas where there is minimum conflict with public use and other resources. These should not be within 150 feet of a stream channel (unless pre-approved by the District Ranger), and in areas which are not highly visible or heavily used by the public. Each staging area should accommodate vehicle parking to minimize the impacts of work vehicles and equipment in developed recreation sites. Employees should be car pooled from off the Forest where practicable. The District staff will monitor these impacts and the District Ranger will impose further restrictions if necessary.
63. When District Ranger or recreation staff feels it necessary, temporary sanitary and trash facilities will be required to accommodate workers, and/or trash will be packed out after each work day. The purpose of this measure is to avoid adversely impacting public sanitary and trash collection facilities.

Scenic Resource

64. Where practical, piles prepared for physical removal, burning, or chipping will be located away from established trails or highly visible areas, such as within areas of concentrated public use. If this is not practical, pile in the most suitable locations and complete the disposal phase at the earliest opportunity.
65. When lop and scattering large plants, place the material away from established trails or roads.

Land Use

66. In areas where treatment adjoins residential private lands, the use of equipment and work crews will be limited to weekdays (Monday to Friday) between the hours of 7:00 AM to 7:00 PM. Prior to project implementation, the project coordinator shall coordinate with the residents to inform them of the nature, amount and duration of increased activity and that minimum noise and disturbance measures were considered in these areas.
67. The District staff will make every reasonable effort to acquire voluntary written agreements with private land owners to access and treat invasive plants on these lands when the invasive plant species are a threat to the national forest. Agreements should ideally be for the duration of this project (15 years) to ensure its maximum effectiveness. If Agreements cannot be obtained, the District staff will take reasonable effort to reach an understanding with the private landowners regarding the locations of applicable private property boundaries. These boundaries will be flagged immediately prior to implementing project work to avoid possible trespass onto private lands. Surveying to cadastral survey standards is not planned.

Heritage Resources

68. Prior to treatments which could adversely affect cultural or historical values, archaeological surveys will be conducted to determine whether any cultural and/or historic resource sites are present in the treatment area.
69. If unanticipated heritage resource sites are found during implementation and ground disturbance is planned, all work shall stop in the area that could adversely affect the site(s). The Forest Heritage Program Manager will be contacted immediately and work will not precede in this area without his/her approval.
70. All known historic properties within an Area of Potential Effect (APE) shall be clearly delineated with appropriate buffers prior to implementing any associated activities that have the potential to affect historic properties. All proposed ground disturbances shall avoid historic properties. Avoidance means that no activities associated with an undertaking that may affect historic properties shall occur within a historic property's boundaries, including any defined buffer zones [unless specifically identified in the First Amended Regional Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region California State Historic Preservation Officer, And Advisory Council on Historic Preservation (2001). Portions of undertakings may need to be modified, redesigned, or eliminated to properly protect historic properties.
71. Buffer zones may be established to ensure added protection where the Forest Heritage Program Manager or other professional archaeologist determines that they are necessary.
72. When any changes in proposed activities are necessary to avoid historic properties (e.g. project modifications, redesign, or elimination; removing old or confusing project markings within site boundaries; revising maps or changing specifications), these changes shall be completed prior to initiating any activities.
73. Heritage resource monitoring may be used to enhance the effectiveness of protection measures in conjunction with other measures.
74. The Forest Heritage Program Manager may provide written approval for any additional work within the boundaries of historic properties, under carefully controlled conditions.

Fire/Fuels Resource

75. Burn piles will be burned in compliance with Forest approved project specific Prescription Burn Plan(s).

Air Quality Resource

76. Prior to prescribed fire activities, the Smoke Management Plan shall be prepared, approved by the South Coast Air Quality Management District (SCAQMD), and made part of the Prescription Burn Plan. Fire perimeter observers shall record smoke conditions during the burn. The weather observations used to establish the burn status prior to the burn shall be recorded and maintained. Signs and notices will be posted in areas near/in the potentially impacted urban interface and general public areas and shall be inspected, maintained and documented to assure proper notification to the public occurred. The Smoke Management Plan will, at a minimum, include the following:
    a) Conduct a prescribed burn only when the meteorological conditions are expected to disperse the emissions away from urban areas and other sensitive receptors and only on approved burn days by the SCAQMD.
    b) Visibility protection of the adjacent Class I and Class II wildernesses will be provided in part through its inclusion as a smoke sensitive area in the required Smoke Management Plan (which will be part of the Prescribed Burn Plan). Other smoke sensitive areas include private lands, occupied recreation sites, and highways.
    c) Identify and address visible smoke column emissions and general smoke nuisance concerns from the public in a timely manner.
    d) Visual smoke observations are monitored on site during burn implementation to insure that smoke dispersion remains within identified parameters as stated in the Smoke Management Plan.
    e) Safety signing, lights, and other devices are employed along traffic routes if smoke may affect visibility on travel routes, as stated in a Smoke Management Plan.
77. "Control fugitive dust on invasive treatment projects by limiting the number of vehicles through carpooling, and by reducing vehicle speeds on native surface roadways".
78. Monitoring for air quality during prescribed fire activities will include the following measures:
    a) Fuel moisture evaluation of the proposed burn piles shall be performed and recorded by the Forest Service. Burning would not be scheduled or initiated unless fuel moisture content is within the parameters established in the burn prescription.
    b) A residual mop-up plan shall be incorporated with the burn prescription. An objective in this plan will be to stop all smoke and smoldering within eight hours of the completion of the burning phase.

Alternatives Considered but Eliminated from Detail Study

Various Treatment Methods as Part of the Integrated Weed Management Prescription

A variety of treatment methods were considered to be included as part of the Integrated Weed Management Prescription but were removed from detailed analysis for various reasons. The following is a description of these treatment methods and why they were removed from detailed study.

Broadcast Prescribed Fire

Broadcast prescribed fire was considered as part of the integrated weed management prescription. The populations of most of the invasive plant species within the project area do not cover large monoculture areas (five or more acres) where broadcast prescribed fire could be effective. In addition, many invasive plant species are opportunistic after fire (e.g. tamarisk and arundo) and broadcast

prescribed fire could encourage expansion of these species. Also, fire in mixed stands of natives and invasive plants tend to favor the invasives in most cases at the expense of the natives.

Grazing

None of the project area is within active grazing allotments and some areas are not suitable for grazing according to the Forest Plan (appendix J, part 3, p. 79; USFS 2005): Critical Biological Land Use Zones, specially designated forest system lands (e.g. wilderness areas), In addition, much of the project area would not be appropriate for grazing because treatment areas are within or directly adjacent to riparian habitat and/or located in narrow canyons.

Pre-emergent Herbicides

Pre-emergent herbicides was discussed as an optional treatment method but was eliminated from consideration because the potential adverse effects on native plant species outweighed the potential benefits.

Broadcast Spraying of Herbicides

Aerial and boom spraying of herbicides were discussed as optional treatment methods but given that most of the invasive plants are interspersed with native vegetation; presently do not grow in large sized monocultures; the terrain would be difficult to access mechanized wheeled and/or tracked equipment to the treatment sites; and broadcast spraying has greater potential to adversely affect the environment and is controversial, these treatment options were removed from detail analysis.

Large and Heavy Equipment

As noted above, in most of the project area it would be difficult to access treatment areas with large mechanized wheeled and or tracked equipment. In addition, the majority of the treatment areas is within or directly adjacent to riparian areas and is comprised of mixed stands. Treatment with heavy equipment is not suited for mixed stands. It was determined the use of large and heavy equipment as a treatment method in the majority of the treatment areas would cause unreasonable environmental harm. Small tractors and chippers might be used to help do treatments and dispose of treated vegetation.

Herbicide, Only Proposed Treatment Method

An herbicide only treatment method was considered but was eliminated from detailed analysis. It has been found, the most effective treatment for a variety of invasive plant species is through an Integrated Weed Management approach which includes a toolbox of treatment methods (and mix of methods) available given the specific environmental conditions at the treatment site.

Future Herbicides approved through Adaptive Management

Including herbicides that are not listed in the proposed action but could be State approved with Forest Service risk assessments in the future was considered as part of adaptive management but was eliminated from detailed analysis. It was decided any new herbicides proposed as a treatment method not analyzed in this document would need to be analyzed with the opportunity for public comment before it/they could be approved for use.

Original Proposed Action

The proposed action was revised from when it was first scoped. Basal bark treatment as a backpack spraying method was added. In addition, wicking application was added whereas a wick or rope is used to wipe or brush over the weed. The intent of adding these herbicide treatment methods is to provide a wide variety of herbicide treatment methods that focus the treatment on target species. In addition, design features were deleted, modified, and/or added based on further analysis of specific

resources. Several of the design features were not reducing effects but were ensuring coordination occurred and appropriate approvals were acknowledged. Many of these design features were incorporated into the proposed action description. Additional information was added to the proposed action including tables that provided more project description details. Detailed restoration activities were added to the project description. Since scoping occurred, a draft monitoring plan was developed for this alternative and is maintained in the Project File.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in table 6 focuses on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. Detailed information on effects is located in chapter 3 of this document.

Table 6. Summary comparison of alternatives.

	Alternative 1	Alternative 2	Alternative 3
Treatment Methods	manual/mechanical, limited herbicide	biological control manual/mechanical fire wilting and herbicide	biological control manual/mechanical and fire wilting
Predicted Annual Treatment (miles/acres)	.5 miles/100 acres	10 miles/750 acres	2 miles/300 acres
Potential affect on invasive weeds	Very little eradication or control except in specific small areas covered by other projects	Focus on eradication and control of high and moderate priority species	Focus on control and containment of high priority species only
Human Health and Safety Risks*			
Fire risk	low-moderate increasing risk	negligible-low decreasing risk	negligible-low increasing risk
Herbicide	no risk	negligible-moderate risk	no risk
Non-herbicide	no risk	negligible-low risk	negligible-low risk
Invasive Weed Trends by species priority			
High priority	increase in # of species/area	eradicated in important areas	no change or decrease in # of species/area
Moderate priority	increase in # of species/area	decrease in # of species/area	increase in # of species/area
Low priority	increase in # of species/area	little change in # of species/area	increase in # of species/area
Special Status Biology (long-term impact to habitat) _____			
Plants	decrease in habitat	increase/maintenance of habitat	increase/maintenance of habitat in areas w/ high priority spp, decrease in habitat other areas
Wildlife	decrease in habitat	increase/maintenance of habitat	increase/maintenance of habitat in areas w/ high priority spp, decrease in habitat other areas

	Alternative 1	Alternative 2	Alternative 3
Water/Soil (long-term impact)			
Water quality	fire effects increase	fire effects decrease	no change or fire effects increase
Water quantity	decrease in water quantity	increase in water quantity	slight increase in water quantity
Soil	chemistry change in soil	no change or some improvement	no change
Wilderness (long-term)			
Experience	no impact	increasing positive experience	no impact or increasing positive experience
Character	adversely impacting natural appearance and biodiversity	increasing natural appearance	no impact or slightly increasing natural appearance
Recreation Experience			
Short-term	no impact	herbicide use could close rec areas temporarily (1-2 days)	need for more follow up treatments could adversely affect rec users
Long-term	reduced access to riparian area due to density of invasives	no restricted acces to riparian area that would have been caused by invasives	less restricted acces to riparian area that would have been caused by high priority invasives spp
Scenic Resources	Noticable difference due to loss of vegetation diversity	No noticable difference, diversity is maintained by eradication and control of invasives.	Minor noticable difference due to loss of diversity to invasives not able to treat.

*In chapter 3 of this EA, human health and safety was broken into three categories: fire and fuels (risk of wildfire), herbicides treatment (risk to applicators and pubic), and non-herbicide metho

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter focuses on the environmental effects (direct, indirect, cumulative) and a brief summary of the affected environment (where applicable) for those resources that were concerns to the public and/or the interdisciplinary team during scoping. It also presents the scientific and analytical basis for the summary comparison of alternatives presented in table 6. This chapter also provides a preliminary finding of no significant impact based on the definition of "significantly" provided by the Council of Environmental Quality (40 CFR 1508.27). Several specialist reports for this and the adjacent San Gabriel Watershed project are referred to in this chapter and they are all incorporated by reference. The ID Team has reviewed multiple studies and environmental assessments done on the use of herbicides and manual methods to control invasives and the effects on humans and biological resources. These analyses and studies that were reviewed are listed in the Reference Section.

The project area is all National Forest System (NFS) lands in the Santa Clara watershed, and adjacent private properties where landowners may make an agreement to cooperate with the Forest Service to conduct treatment. This watershed includes the tributaries of the Santa Clara flowing from the north aspect of the San Gabriel Mountains and the southern aspect of the Sierra Pelona Mountains. The San Gabriel Mountains and Sierra Pelona Mountains are a part of the southern California Transverse Range, and are located in Los Angeles County. The Santa Clara River is one of the last largely free flowing rivers in the region and it eventually drains into the Pacific Ocean some 40 miles from the Forest.

The physical and biological landscape is shaped by the dynamic nature of the Transverse Range. The elevation of the project area ranges from 1,200 to almost 6,000 feet near the highest point near Pacifico Mountain. The San Gabriel and Sierra Pelona Mountains have a Mediterranean climate, which is marked by hot dry summers and cool wet winters. The climate is also characterized by wide variability in precipitation from year-to-year and storm-to-storm. Individual rainfall events can also vary widely with intense storms delivering substantial precipitation in a few hours' time. Other natural processes that have and will continue to influence the physical and biological landscape are fire and flooding.

Human Health and Safety

Fire and Fuels

Alternative 1, No Action Alternative

Invasive plants, such as arundo and tamarisk, generally, can increase the frequency, intensity and/or prolong the length of fire season. In addition, tamarisk typically produces a nearly continuous litter layer that is highly flammable (Brooks 2008). Fires that start in these surface fuels can easily carry through mature tamarisk up into the canopies of native riparian trees. This can change what was naturally a fire regime of a low to moderate intensity surface fire regime to a frequent, high intensity crown fire regime (Brooks and Minnich 2006). Presently these highly fire-adapted invasive riparian plant species are not at critical populations within most of the project area, but if no action is taken to prevent the expansion of these two species, over the long-term, there is a risk of these two invasive plant species expanding greatly in the riparian areas within the project area. This could change the fire regime to one of more frequent, higher intensity wildfire, with higher rates of spread. This could indirectly increase the risk to firefighter and public safety that may be in or near these riparian areas. Homes and resources upslope from these riparian areas would be at greater risk if invasives are

allowed to become dominant in these areas. There are no cumulative effects related to fire and fuels from the no action alternative since the no action alternative does not propose any activities.

Alternative 2, Proposed Action and Alternative 3, No Herbicides

Both action alternatives (alternatives 2 and 3) consider tamarisk and arundo as high priority invasive plants to treat. Both plant species are difficult to successfully eradicate without herbicides, but in alternative 3, where no herbicides are proposed, the focus would be on these species at the detriment of treating other invasive plant species. By treating these two high priority invasive plant species for both action alternatives, the natural fire regime of riparian habitat within the project area would be maintained. The likely long-term indirect beneficial effect by treating these plant species will be reducing the risk for high intensity wildfires and rate of wildfire spread in this habitat type; therefore, reducing the health and safety risks for firefighters and public that may be in or near these riparian areas. Alternative 3 would require far more frequent entry to conduct invasive control work because of the difficulty controlling the primary invasives that cause wildfire issues.

For human safety, related to fire and fuels, the cumulative effects spatial boundary is the project area and temporal boundary is the term of the project. Cumulative effects related to fire regime include the existing condition, other vegetation treatments planned, and recent wildfires in the project area boundary. Fuelbreak treatment/maintenance projects are ongoing and proposed in the area and other hazardous fuels projects have and are being completed. The intent of the fuels projects are to reduce fuels to reduce the risk of high fire severity and decrease health and safety risks to firefighters and the public. Cumulatively, these fuels projects and recent fires, along with this project have a beneficial effect to human safety in the project area as it relates to wildfire.

Public and Worker Health and Safety Non-Herbicide Activities

Alternative 1, No Action Alternative

Since no activities are proposed with the no action alternative, there would be no direct, indirect, or cumulative effects to the health and safety of workers and the public due to non-herbicide project activities.

Alternative 2, Proposed Action and Alternative 3, No Herbicides

Impacts to health and safety of workers and public from non-herbicide project activities would be the same for both action alternatives. Non-herbicide treatment methods, restoration and monitoring activities would have typical field-going health and safety risks (direct and indirect adverse effects) to workers. Field going activities could have adverse impacts to workers due to extreme weather conditions (e.g. heat exhaustion, sun burns, dehydration, slippery areas due to rain/snow, hypothermia), injuries (e.g. car accident, back strain, sprained ankle), physical hazards (e.g. uneven terrain, steep slopes, poorly accessible areas), biological hazards (e.g. poison oak, ticks, rattlesnakes, bees, wasps), and poor communication (i.e., cell phone, radio reception). Design features, including maintenance of a safety plan (which would include job hazard analysis and need for personal protective equipment) and the annual pre-operation briefing, would reduce health and safety adverse risks from these activities to low by reminding workers of the safety risks they face.

Cumulative effects to health and safety of workers from non-herbicide activities would vary depending on their activities. The highest risk for Forest Service employees would entail taking an emergency response assignment (e.g. wildfire) with no rest from strenuous activities from this project. Additionally, volunteers and contractors are also vulnerable to over-extending their physical capabilities. There are safety guidelines to reduce risk to employees and volunteers. The Forest

Service also provides general safety guidelines for contractors. All implementers of this project are personally responsible to ensure all their activities combined do not put themselves and their crew at risk.

Non-herbicide treatment methods, restoration, and monitoring activities should have little to no effect on the general public health and safety. The greatest potential harm, short-term, would be through the use of prescribed fire (smoke) in pile burning for disposal of invasive plant material. There is not much pile burning planned at this time, but the option may be used in some dense invasive situations. Design features included in this alternative proposes to avoid treatments in concentrated public use areas during heavy use periods (e.g. holidays, weekends, school breaks), and propose temporary public use closures in areas where the public and workers co-mingle and safety is compromised. These measures would reduce public health and safety impacts to negligible. There would be no cumulative effects to the public health and safety related to non-herbicide treatment methods, restoration and monitoring activities.

Public Worker Health and Safety Alternative 2, Herbicide Treatment

One of the issues brought up during scoping was the potential unknown human health risks associated with herbicide use.

Alternative 1, No Action Alternative and Alternative 3, No Herbicides

No herbicide treatments are proposed with alternatives 1 and 3; therefore, there would be no direct, indirect, or cumulative effects to human health and safety due to herbicide use.

Alternative 2, Proposed Action, With Herbicides

The effects from the use of any herbicide depends on the toxic properties (hazards) of the herbicide, the level of exposure to the herbicide at any given time, and the duration of that exposure. With herbicide treatment methods proposed for alternative 2, similar worker and public safety risks would exist for field activities (as described for non-herbicide activities), in addition to the handling and use of herbicides. The Forest Service conducts risk assessments independent from US Environmental Protection Agency (EPA) evaluations for herbicide registration, focusing specifically on the type of herbicide uses in forestry applications. Forest Service contracted with Syracuse Environmental Research Associates (SERA) to complete risk assessments for all the herbicides proposed for this alternative and they are incorporated by reference.[11] In addition to the analysis of potential hazards to human health from every herbicide active ingredient, SERA risk assessments evaluate any available scientific studies of potential hazards of these other substances associated with herbicide applications: impurities, metabolites, inert ingredients, and adjuvants. In addition, papers addressing use of adjuvants with herbicides specific to conditions often used by the Forest Service re included in this analysis and they are incorporated by reference (Bakke 2003, Bakke 2007)..

Table 7 provides a summary of hazard indicators and toxicity[12] categories for pesticides, in general.

Table 7. Summary of hazard indicators and toxicity categories for pesticides.[13]

Hazard Indicators	Toxicity Categories			
	I	II	III	IV
Oral LD_{50}*	Up to and including 50 mg/kg	50-500 mg/kg	500-5,000 mg/kg	Greater than 5,000 mg/kg
Inhalation LD_{50}	Up to and including	0.2-2 mg/L	2 to 20 mg/L	Greater than

[11] SERA risk assessments can be downloaded at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

[12] Toxicity is defined as the degree to which a substance is able to damage an organism

[13] Tables 7 and 8 were taken from EPA's website at http://www.epa.gov/oppfead1/labeling/lrm/chap-07.htm

Hazard Indicators	Toxicity Categories			
	I	II	III	IV
Dermal (skin) LD_{50}	0.2 mg/L Up to and including 200 mg/kg	200-2,000 mg/kg	2,000-20,000 mg/kg	20 mg/L Greater than 20,000 mg/kg
Eye Effects	Corrosive; corneal opacity not reversible within 7 days	Corneal opacity reversible within 7 days; irritation persisting for 7 days	No corneal opacity; irritation reversible within 7 days	No irritation
Skin Effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation at 72 hours

*LD_{50} (lethal dose, 50 percent) is the dose of a chemical calculated to cause death in 50 percent of a defined experimental animal population over a specified observation period. The observation period is typically 14 days.

Table 8 provides the Signal Word that is determined by the four acute toxicity categories.

Table 8. Signal Word used for each acute toxicity category.[13]

Toxicity Category	Signal Word
I	DANGER
II	WARNING
III	CAUTION
IV	None Required

Five herbicides are proposed with alternative 2: aminopyralid, chlorsulfuron, glyphosate, imazapyr, and triclopyr. A summary of worker and public health and safety is provided for each herbicide. Detailed information can be found in the Human Health and Safety Specialist Reports along with the SERA risk assessments. Specific application rates would vary with site-specific considerations and would stay within the range analyzed.

Aminopyralid

Aminopyralid is registered by the US EPA for the control of invasive plants. The US EPA has judged that aminopyralid is a reduced risk herbicide.[14] It would also be applied at a lower rate when compared with other comparable herbicides.[15] Its residual action should reduce the need for repeat applications, resulting in a reduction in the amount of herbicides applied to the environment for the control of these invasive plants (OPP-EPA 2005a). The full range of the labeled rates (i.e., 0.03 to 0.11 pound of active acid equivalents[16] per acre [lb a.e./acre]) was considered as the lower and upper bounds on application rates in the SERA risk assessment (2007b) with the typical application rate at 0.078 lb a.e./acre or about 5 ounces formulation per acre. As noted in chapter 2, table 3, these rates would be used for this alternative.

Science indicates that aminopyralid has low toxicity via oral (mouth), dermal (skin), and inhalation (breathing) routes of exposure. The toxicity categories for all hazard indicators are IV (OPP-EPA 2005a). The weight-of-evidence suggests that aminopyralid may not have any remarkable systemic toxic effects.[17] The effects that are most commonly seen involve effects on the gastrointestinal tract

[14] A reduced risk herbicides is an herbicide that pose less risk to human health and the environment than existing conventional alternatives

[15] Comparable herbicides include picloram, clopyralid, 2,4-D, dicamba, monosodium methanearsonate, and metsulfuron methyl.

[16] Acid equivalent (a.e.) is the active part of the acid herbicide being used

[17] Systemic effect refers to an adverse health effect that takes place at a location distant from the body's initial point of

after oral exposure and these may be viewed as portal of entry[18] effects rather than systemic toxic effects. Aminopyralid is rapidly absorbed and excreted and is not substantially metabolized in mammals.

The SERA risk assessment (2007b), along with US EPA, have determined there is no basis for asserting that aminopyralid is a carcinogen (and US EPA has classified aminopyralid as "not likely" to be carcinogenic to humans [OPP-EPA 2005a]). There is also no basis for asserting that aminopyralid would cause adverse effects on the nervous system, immune system or endocrine function. Based on studies completed on reproduction and development, US EPA concluded that there is no evidence of increased qualitative or quantitative susceptibility of the fetuses to aminopyralid (OPP-EPA 2005).

The Office of Pesticide Programs of the US EPA (US EPA/OPP) has derived a chronic (long-term) reference dose (RfD)[19] of 0.5 milligram of acid equivalent per kilogram body weight per day (mg a.e./ kg bw/day or mg/kg/day) for aminopyralid.[20] For incidental (acute, short-term and intermediate exposures), the US EPA has proposed an RfD of 1.0 mg a.e./kg bw/day or incident. Based on calculations completed for this project, at the highest application rate for the various scenarios analyzed in the risk assessment (USFS 2010a), no adverse effects are likely in either workers or members of the general public (SERA 2007b). All scenarios analyzed are below the level of concern[21].

The direct and indirect human health and safety hazard and risk for aminopyralid is negligible. This conclusion is based on the hazards (i.e., formulated end-use products highest toxicity category is IV; "not likely" to be carcinogenic; and no basis to assert aminopyralid would cause an adverse effect on nervous system, immune system, endocrine functions, reproduction and development) and dose response and risk characterization (i.e., all scenarios for workers and public, chronic and acute (longer-term and short-term) exposure calculations were below the level of concern). Complying with the label instructions and design features incorporated in alternative 2 would further lower these negligible risks.

Chlorsulfuron

The typical application rate of 0.056 pounds acid equivalent per acre (lbs a.e./acre or lbs/acre) would be used, with a range of 0.0059 to 0.083 lbs/acre. Alternative 2's maximum rate of 0.083 lbs/acre (1-1/3 ounces per acre) is the maximum rate for a given area in any given year.

Appropriate tests have provided no evidence that chlorsulfuron presents any reproductive risks or causes malformations. Results of all mutagenicity tests on chlorsulfuron are negative. No evidence of carcinogenic activity was found in any of the chronic toxicity studies conducted on chlorsulfuron. In addition, studies in rats show that chlorsulfuron, at exposure levels up to 250 mg/kg/day for 10 weeks does not produce dominant lethal mutations. There are no studies to indicate chlorsulfuron as a direct

contact and presupposes absorption has taken place.

[18] Portal of entry is the route by which a pesticide enters the body, such as orally.

[19] Reference dose (RfD) is a numerical estimate of a daily exposure to the human population, including sensitive subgroups such as children, that is not likely to cause harmful effects during a lifetime. RfDs are generally used for health effects that are thought to have a threshold or minimum dose for producing effects

[20] As noted in chapter 1 of this document, RfD is the basis of measurement to determine whether the herbicide is above the level of concern.

[21] Level of Concern (LOC) - The concentration in media or some other estimate of exposure above which there may be effects. See R-6 Invasive Plant Toolbox Glossary.

neurotoxicant and there is also no evidence that chlorsulfuron would directly affect the endocrine system (SERA 2004a).

Chlorsulfuron is a moderate eye irritant (toxic category III: signal word caution) and is a non-irritant to the skin (toxic category IV). The highest toxicity signal word for chlorsulfuron is caution. Skin absorption is the primary route of exposure for workers. Mild irritation to the skin and eyes can result from exposure to relatively high levels of chlorsulfuron. Chlorsulfuron does not appear to concentrate or be retained in tissues following either single or multiple dose exposures. In all mammalian species studied, chlorsulfuron and its metabolites[22] are extensively and rapidly cleared by a combination of excretion and metabolism.

The risk assessment (SERA 2004a) used the lower and more recent RfD of 0.02 mg/kg/day to characterize all risks involving chronic or longer-term exposures and the RfD of 0.25 mg/kg/day to characterize all risks acute or short-term exposures. Calculations, to determine RfD values for this alternative, were made for the highest application rate at the upper level of exposure (USFS 2010b). For workers, all general and accidental exposure scenarios for chlorsulfuron (at the highest application rate proposed with this alternative) do not exceed a level of concern. For members of the general public there are two scenarios where the levels slightly exceed the level of concern. Chronic (long-term) consumption of contaminated vegetation[23] had an estimated value to 0.05 mg/kg/day (chronic RfD is 0.02 mg/kg/day). The likelihood of someone consuming treated vegetation for 90 days is low. In addition, the potential of this occurring is further reduced by implementing the design feature that requires in areas in which members of the general public might consume vegetation treated [accidentally or intentionally] with herbicides, the vegetation will be cut prior to treatment. Another scenario that slightly exceeds the level of concern involves a small child consuming contaminated water immediately after a spill in a pond.[24] The value was estimated at 0.3 mg/kg/day: the acute RfD is 0.25 mg/kg/day. Design features would minimize the risk of a spill and a spill of the size considered in the scenario (e.g. spill prevention design features; immediate control, containment, and cleanup of herbicides due to spills or equipment failure; mixing and loading of herbicides will take place a minimum of 150 feet from any body of water or stream channel; and limiting the amount of herbicide that can be on site at any given time). Public risk is highest in areas where public use is the highest. High public use areas will be closed during treatment activities and for a day or so following treatment depending on label requirements for reentry into treated areas.

Based on this analysis, the human health and safety hazard and risk for chlorsulfuron is low. This conclusion is based on the hazards (i.e., formulated end-use products highest toxicity category is III, no basis to assert chlorsulfuron is carcinogenic or would cause an adverse effect on nervous system, endocrine functions, reproduction and development) and dose response and risk characterization (i.e., all scenarios for workers and public, short and longer-term exposures are below the level of concern based on this alternative, including the design features noted earlier). Complying with the label instructions and design features incorporated in alternative 2 would lower the risks. These design features include developing and implementing the herbicide transportation, handling, and emergency spill response plan, maintaining a safety plan that includes personal protective equipment/clothing needs, and providing an annual pre-operation briefing for personnel implementing the project.

Glyphosate

[22] Metabolite is referring to a change in the chemical structure of the herbicide molecule. A metabolite is a compound formed as a result of the metabolism or biochemical change of another compound.

[23] Assumes a woman consumed herbicide treated vegetation for 90 days.

[24] Assumes a child immediately consumes contaminated water from a pond (0.25 acres in surface area and 1 meter deep) that had an accidental spill of 200 gallons of herbicide)

There are currently 35 commercial formulations of glyphosate that are registered for forestry applications. The typical application rate would be about 3 lb a.e./acre, with application rates occurring over a range of 0.5 lbs a.e./acre to 8 lbs a.e./acre.

The available experimental studies indicate that glyphosate is not completely absorbed after ingestion and is poorly absorbed after skin exposure. But both glyphosate and the polyethoxylated tallow amine or polyoxyethyleneamine (POEA) surfactant used in Roundup® would damage mucosal tissue, although the mechanism of this damage is likely to differ for these two agents. Many of the effects of acute oral exposure to high doses of glyphosate or Roundup® are consistent with corrosive effects on the mucosa.

Glyphosate formulations used by the Forest Service are classified as either non-irritating or slightly irritating to the skin and eyes. Glyphosate is of relatively low oral and skin acute toxicity (OPP-EPA 1993). Potential human exposure to glyphosate is through skin absorption, inhalation, ingestion or the eye. The highest toxicity category for glyphosate proposed for this project is category III and the toxicity signal is caution. One of the more consistent signs of subchronic or chronic exposure to glyphosate is loss of body weight.

There is no clear pattern suggestive of a specific neurotoxic action for glyphosate or its commercial formulations. The weight of evidence suggests that any neurologic symptoms associated with glyphosate exposures are secondary to other toxic effects. No studies are reported that suggest an effect on the immune system. Glyphosate has not undergone an extensive evaluation for its potential to interact or interfere with the estrogen, androgen, or thyroid hormone systems but tests show no potential effects of glyphosate on the endocrine system. According to the risk assessment (SERA 2003a), there is no basis for asserting that glyphosate is likely to pose a substantial carcinogenic risk. Hardell and Erikson (1999a as referenced in SERA 2003a) reported an increased cancer risk of non-Hodgkin lymphoma (NHL) in individuals in Sweden who have a history of exposure to glyphosate. The US EPA - Office of Pesticides Programs Health Effects Division has reviewed the journal article entitled “A Case-Control Study of Non-Hodgkin Lymphoma and Exposure to Pesticides” and concluded that the study does not change EPA’s risk assessment for the currently registered uses of glyphosate. It was determined this type of epidemiologic evaluation does not establish a definitive link to cancer. Furthermore, the information had limitations because it is based solely on unverified recollection of exposure to glyphosate-based herbicides (OPP-EPA 2002 as referenced in SERA 2003a).

A recent study indicates that Roundup® formulations directly applied to human umbilical, embryonic, and placental cells have adverse effects (cell damage and/or death within 24 hours). The study concluded glyphosate with the adjuvants used in Roundup® (e.g. POEA) synergistically caused greater damage to cells than glyphosate alone (Benachour and Seralini 2009).

Various glyphosate formulations contain a Polyoxyethyleneamine (POEA) surfactant at a level of up to about 20 percent. POEA is more toxic than glyphosate (MMWD 2008) and is known to enhance the skin irritant properties of glyphosate. A design feature requires that only aquatically labeled formulations of glyphosate (e.g. Aquamaster®) and low-risk aquatically approved surfactants (e.g. Agri-Dex®, Class Act® NG®, Competitor®) will be allowed within 100 feet of the banks of flowing rivers and tributaries. This feature would also reduce potential impacts from surfactants that have high levels of POEA (since high levels of this chemical also has adverse effects to aquatic wildlife species). POEA surfactants are not allowed within 100 feet of ponds or flowing streams.

For the current SERA risk assessment (2003a), the RfD of 2 mg/kg/day is used as the basis for characterizing risk from longer-term (chronic) and short term (acute) exposures. Based on the highest application rate, the only scenarios applicable to this alternative that are above the level of concern

relate to acute (3.2 mg/kg/day) and chronic (5.9 mg/kg/day) consumption of contaminated vegetation (USFS 2010c). As noted earlier it is unlikely that an individual would consume contaminated vegetation over a 90-day period within the project area (chronic scenario). The levels would be reduced below the level of concern by implementing the design feature that requires in areas in which members of the general public might consume vegetation treated with herbicides, the vegetation will be cut prior to treatment. Public risk is highest in areas where public use is the highest.

Based on this analysis, the human health and safety hazard and risk for glyphosate is low. This conclusion is based on the hazards (i.e., for the products proposed with this alternative, the highest toxicity category is III; no basis to assert glyphosate cause an adverse effect on nervous or immune systems, endocrine functions and reproduction; US EPA classified glyphosate as non-carcinogenicity for humans) and dose response and risk characterization (i.e., all scenarios for workers and public, chronic and acute exposures, were below the level of concern based on this alternative with the applicable design feature). There are studies that suggest POEA surfactant used with some glyphosate products have higher health and safety risks than glyphosate alone. Complying with the label instructions and design features incorporated in alternative 2 would lower the risks. These design features include the following measures: spill prevention; immediate control, containment, and cleanup of herbicides due to spills or equipment failure; mixing and loading of herbicides will take place a minimum of 150 feet from any body of water or stream channel; only aquatically labeled formulations of glyphosate and low-risk aquatically approved surfactants will be allowed within 100 feet of the banks of flowing rivers and tributaries; minimize the amount of herbicide allowed on site at any given time; and safety measures for workers (e.g. personal protective equipment).

Imazapyr

The most common and effective applications for imazapyr are post-emergent when the vegetation to be controlled is growing vigorously. The typical application rate for imazapyr would be about 0.45 lb a.e./acre, with application rates occurring over a range of 0.03 lbs a.e./acre to 4 lbs a.e./acre.

Although the mode of action of imazapyr in humans or other mammals is unclear, this is partly due to the apparently low and essentially undetectable acute and chronic (short or longer-term) systemic toxicity of this compound. An adequate number of multi-generation reproductive and developmental studies have been conducted and the studies show no adverse effects on reproductive capacity or normal development. Tests of carcinogenic and mutagenic activity are consistently negative, and the US EPA has categorized the carcinogenic potential of imazapyr as Class E: evidence of non-carcinogenicity. There have been many long-term animal studies. Though none focused on the immune system, the results do not indicate imazapyr would adversely affect the immune system. The weight of evidence suggests that imazapyr is not directly neurotoxic, and the available data do not show systemic toxic effects after skin or inhalation exposures to imazapyr. While the available data are limited, there is no basis for asserting that impurities or adjuvants in or metabolites of imazapyr are likely to increase health risk. Based on inferences from standard toxicity studies reviewed in the SERA risk assessment (2004b), imazapyr may impact some aspects of endocrine function (Auletta 1988, Daly 1988 as referenced in SERA 2004b).

RfD of 2.5 mg/kg/day is used to characterize the risks of both short-term (acute) and longer-term (chronic) exposures and is the basis of determining the level of concern. Upper level exposures at the highest application rate estimated for alternative 2 do not lead to estimated doses that exceed a level of concern for workers (USFS 2010d). There is one scenario that is above the level of concern for the public (acute exposure due to consuming contaminated vegetation [5.4 mg/kg/day]). The other scenarios are below the level of concern. As with the other herbicides, this level can be reduced below the level of concern by implementing the design feature that requires cutting edible vegetation that

has the potential of being treated with the herbicide prior to treatment. Public risk is highest in the areas where public use is the highest.

Imazapyr and imazapyr formulations can be mildly irritating to the eyes and skin. The highest toxicity signal category for imazapyr and imazapyr formulations proposed for this project is caution (Toxicity Category III). Mild irritation to the eyes can result from exposure to relatively high levels of imazapyr. From a practical perspective, eye irritation is likely to be the only overt effect as a consequence of mishandling imazapyr. This effect can be minimized or avoided by prudent industrial hygiene practices (e.g. exercising care to reduce splashing and wearing goggles) during the handling of the compound. These measures are included in the design features for this alternative (e.g. personal protective equipment, spill kit).

Based on this analysis, the human health and safety hazard and risk for imazapyr is low. This conclusion is based on the hazards (i.e., formulated end-use products highest toxicity category is III (caution), no basis to assert imazapyr is carcinogenic or that it would cause an adverse effect on nervous system, reproduction and development) and dose response and risk characterization (i.e., all scenarios for workers and public, chronic and acute exposures were below the level of concern based on this alternative with the design features). There are studies that suggest imazapyr may impact the endocrine function. Complying with the label instructions and design features incorporated in alternative 2 would substantially lower the risks. Design features include those that minimize direct contact with imazapyr (e.g. developing and implementing the herbicide transportation, handling, and emergency spill response plan, maintaining a safety plan that includes personal protective equipment/clothing needs, and providing an annual pre-operation briefing for personnel implementing the project).

Triclopyr

Two forms of triclopyr are used commercially as herbicides: the triethylamine salt (TEA) and the butoxyethyl ester (BEE). The typical application rate is 3 lbs a.e./acre with a range of 0.05 lb a.e./acre to 10 lbs a.e./acre.

Studies regarding histopathology and clinical chemistry data on triclopyr suggest that the liver and kidney are the primary target organs. These studies found these impacts would be significant only at relatively high doses. Triclopyr is absorbed and excreted relatively rapidly, with half-life for oral absorption and urinary excretion of 3.6 hours and 1.1 hours, respectively.

There is no information suggesting that triclopyr causes direct adverse effects on the nervous system, endocrine system, or immune function (SERA 2003b). At doses, which do not cause maternal toxicity, there is no apparent concern for either reproductive or teratogenic effects. At substantially higher doses that are maternally toxic, triclopyr has been shown to result in birth defects. Most of the abnormalities have been indicative of delayed growth and have been associated with maternal toxicity. The US EPA/OPP has determined that the evidence for carcinogenicity is marginal and has not recommended a quantitative dose-response assessment for the carcinogenicity of triclopyr. US EPA has classified triclopyr as Group D (i.e., not classifiable as to human carcinogenicity: agents without adequate data either to support or refute human carcinogenicity [OPP-EPA 1998]).

The major metabolite of triclopyr in both mammals and the environment is 3, 5, 6-trichloro-2-pyridinol, commonly abbreviated as TCP. Although TCP does not have the phytotoxic potency of triclopyr, this compound can be toxic to mammals as well as other species. Based on research provided to US EPA, there is no basis for asserting that the use of triclopyr would result in hazardous exposures of humans to TCP (SERA 2003b).

The triethylamine (TEA) salt used in Garlon 3A® has a low acute toxicity similar to that of Garlon 4 Ultra® (BEE), but differs in being substantially more irritating to the eyes and skin. Potential human

exposure to triclopyr is through skin absorption, inhalation, ingestion, or the eye. Triclopyr BEE is of low acute toxicity to humans and is placed by the EPA in Category III, slightly toxic. The TEA salt in Garlon 3® is classified as Category I (highly toxic) because it is corrosive to the eyes in animal tests (MMWD 2008). The highest toxicity signal word for the triclopyr proposed for this project is danger.

The triclopyr RfD values vary for acute and chronic exposures, and male and female. The risk assessment (SERA 2003b) RfDs included: chronic RfD of 0.05 mg/kg/day; acute RfD of 1 mg/kg/day for the general population; and acute RfD for females between the ages of 13 to 50 years (i.e., females of child bearing age) of 0.05 mg/kg/day. For the risk assessment (SERA 2003b), the risk values used for risk characterization for TCP (the metabolite of triclopyr) are 0.025 mg/kg/day for acute exposures and 0.012 mg/kg/day for chronic exposures.

Based on calculations of the typical application rate of 3 lbs/acre and under the upper exposure conditions for this project (USFS 2010e; USFS 2010f), workers and public (both male and female) would be subject to exposure levels above the level of concern for several general and accidental exposure scenarios developed for the risk assessment (2003b). Public risk is highest where public use is the highest. For female workers of child-bearing age, all the worker (one general and four accidental) scenarios are above the level of concern; for the other worker population (i.e., males and woman of non-child bearing age) the backpack spraying is above the level of concern for both types of triclopyr (BEE and TEA); and for triclopyr BEE, the accidental exposure of contaminated gloves and accidental spill on lower legs are above the level of concern.

For workers who may apply triclopyr either once or repeatedly over a period of several weeks or longer (chronic), it is important to ensure that work practices involve reasonably protective procedures to avoid the upper extremes of potential exposure. Following label instructions and design features that are included in alternative 2 would address this need (e.g. personal protective equipment, proper worker hygiene practices, proper handling of the herbicide). Several design features are specific to triclopyr to reduce risk to workers (i.e., triclopyr TEA formulaton will only be used in cases where there is no other approved herbicides that has been shown to be effective and efficient in treating a specific invasive plant, and during the annual pre-operational briefing protective measures [e.g. use of personal protective equipment, proper worker hygiene practices, proper handling of the herbicide] will be emphasized with the use of triclopyr, especially for woman of child-bearing age).

Risk to workers includes skin exposure due to accidental spills. The risk is significantly greater for women of child-bearing age. Precautions should be taken to avoid spills to unprotected skin and eyes, including the use of goggles, double gloves, long-sleeved clothing, and closed shoes. Applicators should have extra clean gloves readily available, soap and water for washing off spills, and an eyewash bottle in their vehicle at all times. Rubber boots are highly recommended. These items will be included in the design features of personal protective equipment, in the herbicide transportation, handling, and emergency spill response plan, and provided for in the spill kit which is required on site.

For the public, children and woman are at greatest risk (above the level of concern) from skin exposure and consuming contaminated products (e.g. water, fruit, vegetation) for both acute and chronic exposure scenarios. Generally, triclopyr BEE have higher calculated exposure rates. To reduce these risks, design features have been incorporated into alternative 2 (e.g. minimize the amount of herbicide allowed at the site; spill prevention measures; immediate control, containment, and cleanup of herbicides due to spills or equipment failure, herbicide spray equipment will not be washed or rinsed within 150 feet of any body of water or stream channel: all herbicide containers and rinse water will be disposed of in a manner that would not cause contamination of waters; mixing and loading of herbicide[s] will take place a minimum of 150 feet from any body of water or stream channel unless prior approval is obtained from a Forest Service hydrologist or biologist; techniques will be used to minimize drift; recently herbicide treated areas should not be reentered, at a minimum,

until the herbicide has dried: if the herbicide label specifies a reentry period, treated areas must be posted with signs warning visitors and others not to enter the treated area; in areas in which members of the general public might consume vegetation treated with herbicides [accidentally or intentionally], the vegetation will be cut prior to treatment; and triclopyr should be the lowest priority herbicides applied and will only be used if the other approved herbicides are not effective and efficient in treating a specific invasive plant. As noted earlier, public risk is highest in areas where public use is the highest.

The U.S. EPA has conducted extensive analyses of dietary exposure to TCP (the metabolite of triclopyr) for the use of triclopyr, as well as the aggregate risks from exposure to TCP from the use of triclopyr. As part of the current risk assessment, exposures to TCP based on modeling of water contamination from the application of triclopyr indicate that the peak exposure to TCP in water is below the concentration associated with the chronic risk value for TCP. Thus, the use of triclopyr would not result in hazardous exposures of humans to TCP (SERA 2003b).

Based on this analysis, the human health and safety risk for triclopyr is moderate, the highest of the five herbicides being considered in this alternative. This analysis rating is based on hazards (i.e., the highest Toxicity Category is I [danger] due to corrosive effect to the eye [TEA salt used in Garlon 3®]); potential effects to liver and kidney from high doses; doses that are maternally toxic, has been shown to result in birth defects; carcinogenicity is questionable (highest EPA classified triclopyr as Group D); and risk characteristics (i.e., acute effects based on the scenarios analyzed are above the level of concern for workers and at least one of the acute exposure scenarios and several of the chronic scenarios are above the level of concern for the general public). The general public is at lower risk than workers because it is less likely the public would come into direct contact with triclopyr from implementing this alternative. Complying with the label instructions and design features included in alternative 2 would substantially reduce the risks.

Adjuvants

Adjuvants are solution additives that are mixed with an herbicide solution to improve performance of the mixture. Adjuvants can enhance activity of an herbicide's active ingredient (activator adjuvant) or offset any problems associated with spray application. Activator adjuvants include surfactants, wetting agents, sticker-spreaders, and penetrants. Surfactants, or surface-acting agents, facilitate and enhance the absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties of herbicides.

Adjuvants are not under the same registration guidelines as pesticides. US EPA does not register or approve the labeling of adjuvants. California Department of Pesticide Regulation does require the registration of those adjuvants that are considered to increase the action of the pesticide it is used with.

The following restrictions to surfactants is applicable to this alternative: must be State approved, only low-risk aquatically approved surfactants will be allowed within 100 feet of the water's edge**,** the surfactant POEA cannot be used within 100 feet of the banks of flowing rivers and tributaries, and nonylphenol polyethoxylate [NPE]-based surfactants dilution rates will be between 0.25 and 2.5 percent.

NPE Surfactants

The primary active ingredient in many of the non-ionic surfactants used by the Forest Service when applying herbicides is a component known as nonylphenol polyethoxylate (NPE). NPE is found in these commercial surfactants at rates varying from 20 to 80 percent. Nonylphenol (NP) is a material recognized as hazardous by US EPA and based on research it appears NP could be an eventual

degradation product of NPE. Both NP and NPE exhibit estrogen-like properties[25] (Bakke 2003). A risk assessment was completed on NPE surfactants in 2003 (Bakke). The risk assessment assumed (and this alternative restricts) commercial NPE-based surfactants mixed with herbicides and water carriers at dilution rates of 0.25 to 2.5 percent with a typical dilution rate of one percent.

Based on subchronic and chronic testing, it appears that the liver and kidney are the organs most likely to be affected by exposures to NPE and NP. No evidence of carcinogenicity has been reported. Values from various studies indicate that NPEs are in EPA toxicity category III or IV to the skin and toxicity category III to the eyes.

At present there are no existing state or federal human exposure guidelines for NPE or NP. US EPA has not established an RfD. A 10 mg/kg for NP has been established for no-observed-effect level (NOEL).[26] The risk assessment (Bakke 2003) extrapolated an RfD figure based on this value of 0.10 mg/kg/day. For ground-based, backpack applications, central estimates of worker exposure are 0.01 mg/kg/day. Based on the estimated levels of exposure and the criteria for acute and chronic exposures, typical exposures to NPE-based surfactants would not exceed the level of concern. For workers, only the upper levels of operational exposure result in estimates of absorbed doses that exceed the derived RfD by a modest amount. The levels would be reduced to below the level of concern through the design features that minimize exposure to herbicides (e.g. personal protective equipment, annual pre-operation meeting to discuss safety).

For members of the general public, the upper limits for chronic exposures are below a level of concern. There is no route of exposure or scenario suggesting that the general public would be at any substantial risk from longer-term exposure to NPE-based surfactants. None of the acute exposure scenarios represent a risk of effects to the public from NPE exposure except at typical rates of application, the drinking of contaminated water after a spill could present a risk of subclinical effects to the liver and kidney. This risk is reduced below the level of concern through the implementation of the design features (e.g. minimizing the risk for spills; restricting the amount of herbicide allowed on site at any given time; no mixing or loading of herbicides will occur within 150 feet from any body of water or stream channel unless approved by a hydrologist or biologist; herbicide spray equipment cannot be washed or rinsed within 150 feet of water; and implementation will be limited to weekdays and non-holidays when public use in the project area is lower).

From a practical perspective, eye irritation and skin sensitization are likely to be the more likely effects as a consequence of mishandling NPE and this risk would be reduced through design features (e.g. safety plan including the need for personal protective equipment, annual pre-operation briefing in which safety issues are discussed including proper worker hygiene practice).

Non-NPE surfactants/adjuvants

Adjuvants, including non-NPE surfactants, typically used by the Forest Service have acute toxicity categories III or IV (except Entry™ II and LI-700® have acute toxicity category I [signal word danger] for the eyes).[27] As with NPE surfactants, the more common risk factors for the use of these adjuvants are through skin or eye exposure. These adjuvants all have various levels of irritancy associated with skin or eye exposure; adverse impacts would be reduced with the design features (e.g. safety plan including the need for personal protective equipment [especially important during

[25] In comparison to the natural estrogen 17-beta-estradiol, NP is approximately 1000 - 100,000 times weaker in eliciting estrogenic responses (Environment Canada 2001a; Giesy et al 2000; Moffat et al 2001; Muller and Schlatter 1998; Routledge and Sumpter 1996; Servos 1999; Sohoni and Sumpter 1998; US EPA 1996; White 1994 as referenced in Bakke 2003). NPE is less potent that NP.

26 A no-observed effect level (NOEL) is the dose of a chemical at which no treatment-related effects were observed.

[27] Severely irritating or corrosive to the eyes

mixing], annual pre-operation briefing in which safety issues are discussed including proper worker hygiene practices [Bakke 2007]).

Based on the analysis for this alternative, including the design features, the risk of adjuvants (proposed at the application rates provided in alternative 2) would be low.

Cumulative Effects of Herbicide Use on Human Health and Safety

Cumulative effects from the use of herbicides include the potential use of herbicides by non-National Forest landowners in the area. Along with these activities, workers and the general public that are in the project area could use some of these herbicides outside the project area for personal activities (e.g. treating weeds on their own property). Glyphosate likely has the highest risk of this cumulative effect (use on private property) because it is the most common herbicide sold to the general public to treat weeds. There are many design features to minimize risk to worker and public health and safety from the use of herbicides from this alternative; therefore, the risk cumulatively from these other activities and this alternative would be low to moderate.

Herbicide Treatment Conclusions

Herbicide use in alternative 2 has no direct beneficial effects to human health and safety from the use. Potential adverse direct and indirect impacts are addressed for each herbicide and adjuvants (generally). There would be indirect beneficial impacts by successfully removing invasive plants that would change the fire regime and fire risk in the riparian areas (e.g. arundo, tamarisk). Cumulative effects are addressed for the herbicides generally based on projects that would utilize pesticides nearby and also for individuals that may be exposed to herbicides from other sources. Numerous design features have been added to this alternative to minimize risk and potential harm to human health and safety for workers and the public.

Table 9 provides a summary of the ratings of risk to human health and safety based on this analysis.

Table 9. Rating of risk to human health and safety for each herbicide and adjuvants (in general) considered in alternative 2

Rating of Risk		
Negligible	**Low**	**Moderate**
Aminopyralid	Chlorsulfuron Glyphosate Imazapyr Adjuvants	Triclopyr

Invasive Plants and Native Vegetation

Affected Environment

The project area largely focuses in and around drainages, but there are multiple vegetation types in the uplands in the project area that include, but are not exclusive to: annual grasslands, chaparral; desert and coastal scrub; hardwood-oak woodland; riparian; lower montane forest; and montane forest. Table 10 provides a summary of approximate acres by vegetation types found within the project area. There are invasive plants in all of these vegetation types. [28]

[28] R-5, USDA CALVEG classification system
http://prdp2fs.ess.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5347192.

Table 10. Approximate acres by vegetation type within project area

Vegetation Type	*Acres*
Annual Grasses and Forbs	26,843
Agricultural	178
Barren	1,307
Chaparral	181,182
Coastal Scrub	20,788
Desert Montane	3,400
Desert Scrub	8,379
Hardwoods- Oak Woodland	7,735
Riparian	2,055
Lower montane Forest	4,601
Montane Forest	458
Montane Meadow	13
Urban/Developed	2,410
Water (mostly from dams)	2,858
TOTAL	**262,207**

Several invasive species are common throughout the San Gabriel and Sierra Pelona Mountains. This includes black mustard (*Brassica nigra*), short-pod mustard (*Hirschfeldia incana*), tocalote (*Centaurea melitensis*), ripgut brome (*Bromus diandrus*), red brome (*Bromus madritensis* var. *rubens*), soft brome (*Bromus hordeaceous*), rattail fescue (*Vulpia myuros*), wild oats (*Avena* sp.), redstem filaree (*Erodium cicutarium*), and cheatgrass (*Bromus tectorum*). These species are most common in areas of high disturbance but are naturalized and are common component of all vegetation types.

Areas with the highest levels of past and ongoing localized and landscape scale disturbances have the highest concentrations of invasive plant species. Additionally, the dams and areas with roads open to the public are also areas where high concentrations of invasive plants occur. This is likely due to high levels of disturbance, high vehicle usage, recreational activities, altered habitat (e.g. private property, Forest administrative sites) and the open, vulnerable nature of the riparian corridors in this area.

Two important components related to invasive plant spread are their reproductive potential and mechanisms for distribution, including vectors for dispersal. Appendix B provides additional information on invasive plant species for this project. The appendix provides a table of high, moderate and low priority species presently considered for treatment; information that identifies reproductive mechanisms that have been identified (Cal-IPC 2003) to allow invasive species to rapidly spread and reproduce; a table of the typical dispersal vectors for each of the high and moderate priority invasive plant species; a map of anticipated pathways for invasive plant species to move from one suitable environment to another; and the vegetation type they are known to occur in. See Table 1 for a list of the high and moderate priority invasive plants on the National Forest in the Santa Clara Watershed.

Many of these species are quick invaders to new areas, including arundo and tamarisk. It is anticipated even with early treatments, tamarisk and other invasive plants will continue to expand in the project area due to the proliferation of seed and seed dispersal by wind and water, or in the case of

arundo, through rhizomes or stem segments. Expansion of invasive plants will vary depending on species, whether vectors are nearby (e.g. roads, trails, flowing water) and amount of existing disturbance. It is anticipated invasive plants in the project area would generally expand at a rate of approximately one to five percent annually but could easily range from one to 15 percent (Asher and Dewey 2005).

Yellow star thistle (YST) is currently found primarily along Interstate 5 Highway. It is also found scattered in adjacent tributaries and up to the ridgetops throughout the I-5 corridor. It is expected that it will spread to all tributaries, riparian and ridgetop areas. Yellow star thistle can cover thousands of continuous acres if it is not treated and removed.

YST is an exotic weed that has become one of California's worst pests. Since its introduction near San Francisco prior to 1860, it has spread steadily throughout California and other western states (Maddox 1981). It infests rangelands, orchards, vineyards, pastures, parks, and natural areas. From 1958 to 1985 its range in California expanded at a roughly exponential rate, increasing from 1.2 to 7.9 million acres (Maddox and Mayfield 1985). This is an estimated increase of over 650% in 27 years. A survey in 1997 by the California Department of Food and Agriculture found YST occurring in 42% of the legal townships within the state (Pitcairn et al. 1998). Uncontrolled, YST invades and eventually dominates the local plant community, becoming the single most-abundant plant in the community. It is favored by soil disturbance, but is clearly capable of invading areas that have not been disturbed by humans or livestock for years, and has invaded a number of relatively pristine nature preserves.

The cost of YST to public and private landowners includes:
1) Reduction in rangeland productivity. Cattle and sheep avoid the spiny flower heads. As the YST infests new areas, productivity is reduced and more land is needed to feed the same number of animals. Public and private landowners have incurred increasing control costs simply to maintain productivity in rangelands. 2) Toxicity to horses. Ingestion of YST causes brain lesions that, eventually, can kill the animal. It is not toxic to cattle or sheep (Corby 1978). 3) Fire hazard. High-density stands become a fire hazard along roadsides and irrigation canals and have resulted in higher vegetation management costs for irrigation districts and county, state and federal highway departments. 4) Reduction in visits to infested state and federal recreational areas. Hikers are unwilling to venture into areas infested with YST, because of its spiny flowers. 5) Need for constant monitoring. YST can invade pristine areas and eventually dominate the native plant community. This threat requires constant vigilance and local eradication efforts of newly discovered infestations. This has increased costs of the vegetation management in wildlife areas and nature preserves.

Invasive Plant and Native Vegetation Environmental Consequences

Alternative 1, No Action Alternative

The no action alternative maintains the present course of only minor amounts of treatment of invasive plant species in the project area. The result of no action is that the populations of invasive plant species would continue to expand in and beyond the project area. Impact intensities can vary from site to site depending on the invasive species present, the densities and other biotic and abiotic interactions. It is assumed that the current populations of invasive species would continue to expand both in population size and population numbers with alternative 1. If only minor amounts of treatments occur in the project area over the next 15 years, this would result in long-term, moderate to major, widespread impacts from invasive plants on and adjacent to the National Forest.

If the invasive species are left unchecked, the ecosystem in these drainages could be dramatically changed. Invasive plants could create a host of adverse environmental effects, including:

displacement of native plants; alteration of the hydrology of riparian habitat, and reduction in habitat and forage for wildlife (including threatened, endangered, and sensitive species); reduction in water quantity; potential reduction in soil productivity; and potential changes in the intensity and frequency of wildland fires. After wildland fires in this area, non-native plant species typically re-establish more rapidly than native plants, suppressing the recovery of the native vegetation and allowing the invasive plants to expand their range. In addition, when wildland fires occur too frequently (tamarisk and arundo-dominated communities experience higher fire frequencies than native riparian communities), some of the native vegetation lose the ability to recover, effectively converting high diversity native plant communities into low diversity non-native communities.
With no action, the expansion and successful establishment of new invasive plant invaders, depending on how aggressive they are, could be a major, long-term, adverse impact. Experience has shown, early detection and rapid containment of invasive plant species is the most effective method for controlling their spread.

Alternative 2, Proposed Action (Focus on Herbicide Treatment Methods)

This section addresses direct and indirect effects to invasive plants and native vegetation specific to the use of herbicides. Integrated weed management typically combines several treatment methods (e.g. cut and paint/spray) and does not rely on herbicide treatment alone. This section focuses on herbicide treatment with the knowledge most herbicide treatments would be combined with other treatment methods. Impacts from using non-herbicide treatment methods, solely, and other activities are addressed in the next section.

Herbicide treatment has the potential to be highly effective in treating specific invasive plants (Randall and Hoshovsky 2000), and is safer and more effective when combined with other manual treatment methods. Effectiveness varies based on the invasive plant species and treatment methods chosen. There is no known treatment method (including herbicides) that would eradicate tree-of-heaven in one treatment. Foliar/spot spraying can be used if the leaves are within reach, cut stump/paint, hack and squirt and stem injections also would kill aboveground parts of the plant. At least one secondary foliar/spot spraying application of herbicide is required to cause mortality (Pannill 2000). This is also true of other priority invasive plant species. It is anticipated, in many cases, multiple treatments, including herbicides, would be needed to be effective.

Direct effects to invasive plant species would be the removal of individuals and populations, which has a localized beneficial impact to the environment in the short-term, and is likely to be a beneficial impact over a widespread area in the long-term due to the reduction or removal of seed or propagule sources.

Indirect impacts to desirable native species are possible with the application of herbicides. As an example, during wind speed conditions of 15 mph, backpack sprayer applications of Garlon 4® (triclopyr BEE) can drift as far as 68 feet. The individual sensitivity of plants to the application of Garlon 4® has been found to vary across plant species with direct application (SERA 2003a).

The distribution of the invasive species across the landscape is generally not uniform, but individuals occur in clusters, and on occasion, individually. This results in potential localized adverse impacts to non-target individual native plant species from the use of herbicides. This impact would vary, at a minimum, depending on native plant species involved, which of the five herbicides is used, the application rate, and herbicide treatment method (e.g. foliar spray, cut and daub). This impact has the greatest potential to occur with the broad-spectrum, nonselective herbicides such as glyphosate. Direct impacts could occur to native plants from drift or accidental direct application, injuring or killing individuals, and/or indirectly by the residual chemicals in the soil that could transfer to unintended roots or unexpressed bulbs. These impacts are anticipated to be adverse, but localized and short-term. Design features have been developed that would greatly reduce the potential for adverse

impacts. The benefits of invasive species eradication and control are substantial in this very important watershed.

Alternative 2, Proposed Action and Alternative 3, No Herbicides (Specific to non-Herbicide Activities)

This section addresses direct, indirect and cumulative effects to invasive plants and native species specific to non-herbicide activities.

Mechanical and Hand Treatment Methods

Manual and mechanical treatments physically remove and destroy, or interrupt the growth and reproduction of invasive species. These methods can be highly effective in small populations of species that can be easily pulled, or with adequate workforces on larger populations. These methods are not as effective on deep rooted perennials or rhizomatous species, where root fragments can be left in the ground to generate new plants (Tu et al. 2001).

One of the beneficial impacts of hand pulling, pulling with tools, and clipping is the ability for high selectivity, with limited damage to desired native species. This treatment has beneficial impacts at least in the short-term, by removing target or priority invasive plant species. If it does not result in mortality for the treated individuals it is likely to, at a minimum, adversely impact its growth and reproductive potential. Some species though, like arundo or English ivy, can be stimulated by this kind of disturbance as it can create numerous vegetative propagules, which are able to develop into individual plants. This could be an adverse, minor to moderate, long-term impact if follow up monitoring and treatment do not occur, as these vegetative propagules could be dispersed to colonize other localities. Arundo is known to disperse during flooding events, spreading rapidly (Cal-IPC DCCC) from these vegetative propagules.

Hand pulling tools (e.g. weed wrench), clipping, and pulling create localized soil disturbance both where the root unearths and where foot traffic occurs. The risk associated with this soil disturbance is recolonization by invasive plants. The degree of soil disturbance depends on the density and size of invasive plants being removed; varying from negligible where only a few individuals occur, to moderate, where high densities of individuals occur. Whether this impact is short or long-term is dependent on several factors. If the areas being treated have a high native plant component, it is likely that natural succession would occur and the disturbed area would be recolonized by native plant species. Adverse impacts in these areas would be short-term. If the areas have high densities of invasive species and a low native species component, restoration and monitoring may be necessary post-treatment for a net reduction of invasive species cover.

Cutting and other methods of removing the aerial parts (e.g. chainsaw, weed-wack) can weaken the target plant or remove reproductive structures. If the target plant has underground reproductive structures that facilitate resprouting, this treatment would have only short-term beneficial impacts. Some species are stimulated to grow by the removal of the stems, and others if whacked back would still grow and flower at a lower height (e.g. yellow star thistle). These treatment methods involve highly selective methods for removing target plants and are likely to result in negligible adverse impacts to the native vegetation.

Tarping may be useful for small areas with low growing invasive plant species, such as bigleaf periwinkle, ivy or Himalayan blackberry. It rarely results in mortality of the target invasive, as many of these species have been known to regenerate repeatedly from underground parts. There is the potential that tarping could assist in reducing the vegetative cover, allowing for easier access to the rootballs and rhizomes. This technique could also assist in limiting spread. Independently this treatment has the potential for negligible to minor beneficial impacts, though adverse impacts could

result if native vegetation was also tarped and no restoration occurs post-treatment. Therefore, this method is generally best for solid stands of invasives, which are not mixed with natives.

Fire-wilting methods involve using a hand-held torch to burn individual plants. This method has been used with some success on thistles (Hoshovsky and Randall 2000) and to girdle scotch broom plants. It has the advantage in that it can to be used in wet weather, though may be limited in usefulness given the extended fire season experienced in the project area. This technique is beneficial as it has limited impacts to other desirable native plants, but is time consuming.

Biological Control Agents

Biological control agents (biocontrols) are generally selected to control invasive plants population densities to below a damaging threshold (USFWS 2008). Biocontrols are reviewed and approved by APHIS, and must exhibit host specificity. In addition, the State of California also tests and approves the use of biocontrols in California. There is a risk that an approved biocontrol agent could impact non-target species (USFWS 2008). Some of the potential risks of biocontrols include competition with native species, predation/herbivory/parasitism of non-target species, potential for increased impacts due to lack of co-evolution with environmental controls, dispersal to other regions where impacts could differ, and evolution of the biocontrol that changes target species (Simberloff and Stiling 1996). APHIS completes the NEPA process before any biocontrol agent is released. This involves making sure the release is in compliance with the Endangered Species Act and all aspects of NEPA including preparing either an EIS or EA and any other relevant reports (www. http://www.aphis.usda.gov).

Biocontrols require two to three years to become established and are thought to require ten to twenty years before they significantly affect the invasive plants populations (USFWS 2008). This has the advantage of providing a long-term solution for target invasive plants. It has been shown to be most effective when used in the context of an IWM approach. Biological controls have the advantage of requiring limited resources to deploy and have been found to be effective in control of some species, such as yellow star thistle (FICMNEW 2004) and tamarisk (Carpenter 1998). This strategy would be the most effective with widespread invasive plants (e.g. tocalote, cheatgrass) as other management options are unrealistic due to financial and workforce resources limitations. The only biocontrol being proposed at this time is for yellow star thistle. Controlling and containing yellow star thistle is very important to the health of the watershed.

Adaptive Management or Early Detection and Rapid Response Strategy

This strategy would result in beneficial impacts to the vegetation types locally and would be beneficial regionally in the long-term, as it prevents the spread of new invasive plant populations to other portions of the project area and beyond.

Restoration and Monitoring

Invasive species are known to thrive in recently disturbed sites. The removal of invasive plants, even if soil disturbance is minimized, would still result in some disturbance. Many invasive plant species, such as annual grasses, red stem filaree and tocalote, are ubiquitous throughout the Forest; therefore, have high potential to invade the recently treated areas. The intensity of the restoration required would be dependent on the disturbance regime and site potential for reestablishing a native community. Active or assisted restoration of degraded sites would greatly reduce the potential for continued invasion, or replacement of the target species with other invasive plant species.

Monitoring is an important component in these action alternatives. This is especially important with invasive plant species that have long-lived seedbanks and persistent underground structures like

rhizomes (appendix B, table 15). It also allows for the adaptive management strategy to be applied, allowing for the results to confirm or facilitate change in the treatment regime.

Restoration and monitoring have long-term, beneficial, localized impacts to regeneration of native habitat, and increase in invasive plant treatment success. Depending on the habitat connectivity, vectors, and pathways, there are potential beneficial widespread impacts as well, due to the reduction in seed source and propagules available to infest other sites.

Vectors Associated with Project Implementation

No new road construction would result from project implementation. The primary increases in vectors from this project are from foot and vehicle traffic. Seeds or vegetative parts of many invasive species are adapted to cling to fur, but they also cling to clothing and the undercarriage of vehicles used to access project sites. As project activities are concentrated in areas with infestations of invasive plant species, there is an increased risk for propagules or seeds adhering to the clothing of individuals and the tires and undercarriage of vehicles. Studies have found that an average of 33 percent of debris is left on machinery and vehicles even with preventative action (USFS 2008). Washing vehicles for at least six minutes increased removal of debris to the 95 percentile. A design feature reduces this adverse risk by requiring vehicles be washed a minimum of six minutes after driving through or parking in invasive plant infestations. Another design feature requires efforts be made to remove invasive plant seeds and propagules from clothing, greatly reducing the risk for spread through this vector. Anticipated impacts due to risk of invasive plants spreading due to vectors associated with project implementation could be short or long-term (depending on the invasive plant species being spread), adverse and negligible.

General Effectiveness of Treatments

Alternative 1, No Action

As noted earlier, invasive plants would continue to enter into and expand within the project area with this no action alternative. Alternative 1 would likely have the greatest increase in invasive plant growth (both in terms of number of species and size of area) when compared with the other two alternatives.

Alternative 2, Proposed Action

Invasive plant species trend for alternative 2 would be an overall decrease of invasive plant growth over the 15-year term of the project (both in terms of number of species and size of area). Alternative 2 includes herbicides as one of the tools available in integrated weed management, which provides more opportunity for successful treatments at lower costs. Monitoring is required to determine effectiveness of treatments (appendix D) and modifications on treatment methods could occur based on the finding. This alternative has the greatest likelihood for success in eradicating and/or controlling high and moderate invasive plant species within the project area. Effectiveness of treatment in the 80 to 90 percent realm is possible with the use of herbicides in the invasive plant control toolbox. Totally non-herbicide methods often require many more follow-up treatments.

Alternative 3, No Herbicides

Alternative 3 would have an overall trend of controlling and containing the high priority species populations with an overall increase of the other invasive plant species (in terms of number of species and size of area) over the term of the project. This alternative would focus treatments on the high priority species, all of which are difficult to eradicate with the treatment methods allowed. This alternative would require a higher number of multiple treatments over a longer period of time when compared to alternative 2. It would also likely require treatments to occur multiple times in a given year to have greater success in weakening the root structure of these high priority plants. Control and

containment of the high priority species is possible with manual and mechanical methods, but without a year-to-year sizable workforce and funding, eradication is unlikely. Due to the level of treatments and monitoring needed for the high priority invasive plant species, less treatment would occur on the other invasive plant species. As with alternative 2, monitoring would allow for changes in treatment (adaptive management) based on success. This alternative would require more entries over the long term to eradicate and/or control the species from the site. In most cases, this alternative would also require more work-hours to complete the work in a given area when compared to the use of herbicides. Due to the additional work likely to be required in treating the high priority invasive plants (i.e., arundo, tamarisk, and tree-of-heaven), the moderate/low priority invasive plants (i.e., forbs and some woody plants) may not receive treatment or receive very little treatment. In addition, not using herbicides would be less effective for many invasive species. As with alternative 2, this alternative would not allow large and heavy mechanical equipment (dozers) as a treatment method in the treatment areas.

Invasive Species Cumulative Effects

The cumulative effects spatial boundary considered in this analysis is the Santa Clara River watershed including all of the tributaries that flow from the National Forest. This boundary is based on the topographic separation from adjacent watersheds, limiting the amount of spread the target invasive plant species are capable of dispersing. The temporal boundary is 15 years, the term of the project.

Alternative 1, No Action

There are no cumulative effects related to invasive plant species from the no action alternative since the no action alternative does not propose any activities.

Alternative 2, Proposed Action

Most of the other actions considered in the cumulative effects analysis area contribute to the increase in invasive species distribution and abundance. This alternative provides measures to reduce these effects. The adaptive management strategy makes it possible to choose the most effective management strategy for existing invasive plants, and to treat new infestations as they arise. This is a beneficial strategy with the potential adverse impacts that may result from climate change, wildfire events, and other land management activities. The restoration and monitoring strategy facilitates reducing the risk of new invasive plant species or expansion of existing ones in areas impacted by activities (e.g. recreation, wildfire) within the project area. The full extent of human and wildfire impacts from invasive plants are unlikely to be fully mitigated by this alternative, as the impact from these events/actions are at a landscape scale.

Alternative 2 would beneficially combine with several ongoing and proposed Caltrans and utility company projects and restoration (requirement by Forest is that they conduct restoration after completion of their projects) as it can provide additional monitoring and invasive plant removal. Alternative 2 provides a benefit to native vegetation by providing optimum control of invasives resulting from maintenance of fuelbreaks and fire clearance around developments. Fuelbreaks remove and suppress native stands of vegetation and are prone to invasion by invasive plants; this alternative helps mitigate these actions.

Multiple Forest health and fuels projects are occurring in the watershed. An Environmental Assessment is being prepared for the Defensible Space project which will allow private landowners adjacent to the Forest to treat hazardous fuels on the Forest up to 200 feet from their homes. This project has high potential to increase invasive species on the National Forest. This invasive species treatment project would allow for treatment of the invasive plants known to occur, reducing the risk for spread during and after project activities. Although these projects have the potential to bring in

and allow expansion of undesirable invasive species, this alternative would allow for an increased IWM approach and would likely improve the efficacy of the treatments and restoration.

Alternative 2 combines with many of the cumulative effects beneficially, both widespread and locally, in the long-term by either expanding their capacity for control and eradication efforts, or by mitigating their potential for increasing invasive plant distribution and abundance in the project area. This alternative will have a beneficial effect by controlling a large portion of the most adverse invasive situations over the life of the project.

Alternative 3, No Herbicides

Alternative 3 would have similar cumulative effects as Alternative 2. The main distinctive difference is that this alternative would not treat as many acres or be near as effective. The lower capacity for acreage treated would result in increases of the moderate and low priority species, which has cumulative long-term adverse impacts.

Alternative 3 interacts with the cumulative effects that increase invasive plants (e.g. fuelbreaks, recreation, private properties, vectors and pathways, ground disturbance from Forest projects) in a negligible to minor beneficial way by controlling a portion of the net invasive plant populations in the cumulative effects analysis area.

Special Status Plants

As noted earlier, special status plant species are federally listed threatened, endangered, proposed and candidate plant species under the Endangered Species Act and Forest Service sensitive plant species.

Affected Environment

There is occupied and suitable habitat for Nevin's barberry (*Berberis nevinii; federally endangered*). In addition, the following 33 Forest Service sensitive plant species have suitable habitat within the project area: San Antonio milk-vetch (*Astragalus lentiginosus var. Antonius*); Scalloped moonwort (*Botrychium crenulatum*); Slender mariposa lily (*Calachortus clavatus var. gracilis*); Plummer's mariposa lily (*Calachortus plummerae*); Peirson's spring beauty (*Claytonia lanceolata var. peirsonii)*; San Fernando Valley spineflower (*Choriznthe parryi var. parryi*); San Gabriel River dudleya (*Dudleya cymosa ssp. Crebrifolia*); San Gabriel Mountain dudleya (*Dudleya densiflora*); Many stemmed dudleya (*Dudleya multicaulis*); San Gabriel bedstraw (*Galium grande*); Urn flowered alum root (*Heuchera elegans*); Mesa horkelia (*Horkelia cuneata ssp. puberula*); San Gabriel Mountain sunflower (*Hulsea vestita ssp. Gabrielensis*); California satintail (*Imperata brevifolia*); Fragrant pitcher sage (*Lepechinia fragrans*); Lemon lily (*Lilium parryi*); San Gabriel linanthus (*Linanthus concinnus*); Peirson's lupine (*Lupinus peirsonii*); Hall's monardella (*Monardella macrantha ssp. Hallii*); Rock monardella (*Monardella viridis ssp. Saxicola*); Baja navarretia (*Navarretia peninsularis*); Woolly mountain-parsley (*Oreonana vestita*); Rock Creek broomrape (*Orobanche valida ssp. Valida*); Fringed grass-of-parnassus (*Parnassia cirrata var. cirrata*); Transverse range phacelia (*Phacelia exilis*); Ewan's cinquefoil (*Potentilla glandulosa ssp. Ewanii*); Southern skullcap (*Scutellaria bolanderi ssp. Austromontana*); Parish's checkerbloom (*Sidalcea hickmanii ssp. Parishii*); Chickweed starry punturebract (*Sidotheca carphylloides*); Laguna mountain jewelflower (*Streptanthus bernardinus*); Southern jewelflower (*Streptanthus campestris*); San Bernardino aster (*Symphyotrichum defoliatum*); and Sonoran maiden fern (*Thelypteris puberula*).

Details on range and distribution, habitat requirements, threats and potential for occurrence within the project area for each of these species can be found in the biological evaluation (and biological assessment for Nevin's barberry) being completed for this project.

Special Status Plants Environmental Consequences

Alternative 1, No Action Alternative

The no action alternative maintains the present course of only limited very project specific treatment of invasive plant species in the project area. Impact intensities to special status plants would vary from site to site depending on the invasive and special status plant species present, densities, and other biotic and abiotic interactions. It is assumed that the current populations of invasive species would continue to expand both in population size and population numbers with alternative 1. If no treatments occur in the project area over the next 15 years (other than through other project activities), the resulting expansion and introduction of invasive plants could continue to adversely indirectly impact special status plants through increased competition for resources and by rendering unoccupied suitable habitat, unsuitable. This alternative has the potential for adverse long-term, moderate to high, localized and widespread impacts.

Alternative 2, Proposed Action, Specific to Herbicide Treatment Methods

This section addresses direct and indirect effects to special status plants species specific to herbicide treatment, realizing herbicide treatment would likely involve other treatment methods (e.g. cut and daub).

The intent of this alternative is to improve, protect, and restore native habitat conditions. Though this is a long-term beneficial impact, there is the potential for adverse short-term impacts. Design features have been integrated into the proposed action to eliminate or minimize the potential adverse impacts from herbicide treatments.

Herbicide application effects to non-target plants (which includes special status species) are extrapolated from the SERA risk assessments (SERA 2003a, b; 2004 a, b; 2007b) and herbicide labeling. Generally, herbicides have been tested on only a limited number of plant species and mostly under laboratory conditions. While laboratory experiments can be used to determine acute toxicity, laboratory experiments do not account for plants in their natural environments, nor do they address the effects on the plant species being considered in this document. This leads to some uncertainty in the risk assessment analysis.

The five herbicides considered for use in alternative 2 have the potential to adversely impact special status plants, if unintentional application occurred. Though broadcast spraying would not be utilized in this alternative, foliar and spot spraying and some of the stump applications are generally conducted with a backpack sprayer, which can result in minor drift of the herbicide. Much of the herbicide application in the proposed action would be conducted by cut and daub, hack and squirt, and other localized application methods. These methods almost eliminate the risk associated with drift, and greatly reduce the amount of herbicide applied.

There is little available information on the impacts of adjuvants on terrestrial plants, other than on target species. It is assumed in this analysis, that alternative 2, including the design features for herbicide application, are conservative enough to also insure protection of special status plant species from the potential adverse impacts of the various adjuvants. Design features have been included to substantially reduce the risk.

Currently, only one federally endangered plant species (Nevin's barberry) is known to occur in the project area. Since suitable habitat exists for this species and many sensitive species, a design feature was added requiring that pre-implementation plant surveys will be conducted to determine presence or absence of specially listed plant species. If federally listed species are found and the project has the potential of effecting the species, consultation with US Fish and Wildlife Service will be initiated. If new federally listed plant species or new locations are found in the project area before or during

implementation, an appropriate buffer will be placed around the plants (see design features 9 and 17) and US Fish and Wildlife Service will be contacted immediately.

The design feature for Forest Service sensitive species provides a buffer from 5 to 70 feet (see design feature 9 and 18) depending on various criteria. Table 11 summarizes some of the toxicities to specific and general plant groups for each herbicide being considered for use. The toxicity to various non-target species would be considered in determining the size of the buffer.

Table 11. Highlighted specific toxicities to plants by herbicide.

Herbicide	Toxicity
Aminopyralid	Nontarget species of dicots are likely to evidence adverse effects over the range of application rates (SERA 2007).
Glyphosate	For relatively tolerant nontarget species of plants, there is no indication that glyphosate is likely to result in damage at distances as close as 25 feet from the application site. Nontarget terrestrial plants are not likely to be affected by runoff of glyphosate under any conditions (SERA 2004).
Triclopyr	Two forms of triclopyr could be used with differing degrees of effects. Triclopyr BEE (butoxyethyl ester) is more toxic to plants than triclopyr TEA (triethylamine salt). Triclopyr BEE formulations are more apt to damage plants from runoff than other formulations. Both formulations have been found to decrease the relative long-term abundance and diversity of lichens and bryophytes (SERA 2003).
Chlorsulphuron	More tolerant species are not expected to be at risk at distances of 25 feet or less. If chlorsulfuron is applied in the proximity of sensitive crops or other desirable plant species, site-specific conditions and anticipated weather patterns will need to be considered if unintended damage is to be avoided (SERA 2004a).
Imazapyr	Damage to non-target plants can occur by being absorbed through roots (Tu et al. 2001) and by being transfered between root networks (SERA 2004). Imazapyr can act as an unintended pre-emergent herbicide, which could impact ungerminated native and nonnative plants.

Other criteria noted in the design feature to determine buffer size are the concentration of herbicide used, phenology at time of treatment, and rareness and imperilment of the species. Larger (meta) populations of Forest Service sensitive plant occurrences that are also not highly rare or imperiled (e.g. Plummer's mariposa lily) could have a smaller buffer. Buffers can also be smaller around Forest Service sensitive plants if they are in the dormancy phase of their life cycle during herbicide treatment. By using these criteria, there is the potential of adversely affecting individual Forest Service sensitive plants but based on the criteria to determine buffer size, the direct adverse impacts are expected to be negligible to minor, localized and short-term. This action will not result in a trend toward federal listing.

Alternative 2, Proposed Action and Alternative 3, No Herbicides, Specific to Non-Herbicide Activities

This section addresses direct and indirect effects to special status plant species related to the non-herbicide activities.

Several design features are incorporated into both action alternatives to reduce potential adverse impacts to specials status plants (e.g. pre-treatment surveys, initiating consultation with US Fish and Wildlife Service if federally listed plants are found and can be potentially impacted, flag and avoid,

and seasonal restrictions). With these design features, individuals would be protected from many of these potential direct impacts through avoidance. Potential adverse direct impacts to special status plant species are negligible to minor, localized and short-term.

The scope of the adverse indirect impacts is likely to be negligible, as the alterations such as changes in micro site climate and localized increases in erosion from the non-herbicide activities would be short-term and localized. Additionally, the reduction in populations of nearby invasive plant species and restoration efforts would improve habitat by reducing competition from non-natives and potentially reducing the risk of overly frequent fire regimes within riparian habitat that is caused by fire-adapted invasive plants (e.g. tamarisk, arundo). The positive effects of reducing invasive plant populations and restoration in potential habitat for the special status species is less so for alternative 3 when compared with alternative 2. This is due to the reduced level of treated acres and non-herbicide treatment methods (e.g. manual, mechanical) are likely to be less effective.

Cumulative Effects

Alternative 1, No Action
As with all resources, no cumulative effects would occur with this alternative since no action is taken.

Alternative 2, Proposed Action
The cumulative effect actions other than the invasive plant removal generally increase the potential for invasive plant distribution and abundance. This project interacts by mitigating these effects, which has long-term beneficial impacts to the special status plants. Beneficial effects include the reduction in potential resource competition, prevention of new invaders, and restoration of habitat.

Nevin's barberry is the only federally listed plant species that has been found on the Forest in the project area. If during pre-implementation plant surveys federally listed plants are found and potentially impacted from this project, consultation with UF Fish and Wildlife Service will be initiated. The proposed action would potentially adversely interact cumulatively, by increasing disturbances in suitable habitat. Through implementation of the design features, these impacts are likely to contribute cumulatively in a negligible intensity in the short-term. In the long-term, the proposed action would be beneficial in restoring and maintaining natural habitat.

Alternative 3, No Herbicides
Alternative 3 is likely to interact with the cumulative effects similarly to alternative 2, though due to the reduction in treatment effectiveness and the anticipated invasive treatment acres with this alternative, there is likely to be less positive effect from this alternative with the anticipated increases in invasives associated with other existing and future projects/activities in the project area. Not using herbicides would result in more ground disturbance than alternative 2. This would reduce the potential beneficial cumulative effects and increase the potential cumulative adverse effects.

Wildlife

Affected Environment

Special Status Wildlife Species

There is suitable and occupied habitat within the project area for six federally listed wildlife species: southwestern willow flycatcher (*Empidonax traillii extimus*; federally endangered); least Bell's vireo (*Vireo bellii pusillus*; federally endangered*)* ; California red-legged frog (*Rana aurora draytonii*; federal threatened); arroyo toad (Anaxyrus californicus; federally endangered); unarmored threespine stickleback, (*Gasterosteus aculeatus williamsoni*; federally endangered);California condor; (*Gymnogyps californianus*; federally endangered). There is also suitable habitat for at least 15 Forest

Service sensitive wildlife species: bald eagle (*Haliaeetus leucocephalus*); California spotted owl (*Strix occidentalis occidentalis*); arroyo chub (*Gila orcutti*); Santa Ana speckled dace (*Rhinichthys osculus*); yellow-blotched salamander (*Ensatina eschscholtzii croceater*); California legless lizard (*Anniella pulchra*); southwestern pond turtle (*Clemmys marmorata pallid*); San Bernardino ringneck snake (*Diadophis punctatus modestus*); San Bernardino mountain kingsnake (*Lampropeltis zonata parvirubra*); San Diego horned lizard (*Phrynosoma coronatum blainvillii*); two-striped Garter snake (*Thamnophis hammondii*); Pallid bat (*Antrozous pallidus*); Townsend's big-eared bat (*Corynorhinus townsendii*); and western red bat (*Lasiurus blossevillii*). Santa Ana speckled dace and Santa Ana sucker are believed to have been introduced into the watershed and are not considered native species. Arroyo chub and partially armored stickleback are also of questionable origin in some areas due to movement around the watershed in historical trout stocking efforts.

Although the California condor occasionally flies over the project area, there are no known heavy use areas in the project area. Condors will not be directly affected by the treatments and disturbance should not be a problem as it will be of short duration and focused in small areas which do not seem to be important to the birds.

Details on range and distribution, habitat requirements, threats and potential for occurrence within the project area for each of these species can be found in the biological evaluation and biological assessments completed for this project.

Management Indicator Species

MIS are animal or plant species identified in the Forest LMP (USDA 2005, Part 1, pp. 44-45) because their population or habitat trends are believed to indicate the effects of management activities. The LMP was developed under the 1982 National Forest System Land and Resource Management Planning Rule, and although new planning regulations were issued in 2012, the LMP direction for MIS is still in effect for plans completed prior to the change in regulations (36 CFR 219.17(c)).The LMP directs Forest Service resource managers to monitor MIS along with other indicators of progress toward achieving overall goals for biological resources.

For the 12 Forest MIS, the Forest LMP, FEIS, Volume 2, Appendix B (USDA 2005) does not limit monitoring efforts to population monitoring, but instead allows for habitat monitoring and analysis. Based on this, project level MIS effects analysis can be informed by forest-scale habitat monitoring and analysis alone.

Environmental Consequences

Alternative 1, No Action Alternative

The no action alternative would result in the continuing survival, growth and spread of invasive plants throughout the project area. If the populations of invasive plants are left untreated, they would over time, degrade, alter and in some cases decrease the amount of suitable habitat available for both aquatic and terrestrial wildlife.

Existing invasive plant populations found in riparian areas could eventually spread and increase in the drainages and seriously alter the vegetative composition and hydrology in those drainages. This would adversely affect aquatic species including, but not limited to, the California red-legged frog, unarmored three spine stickleback, arroyo toad, southwestern pond turtle and two-striped garter snake. Changes in stream flow, depth and water availability would decrease the amount of suitable habitat that is available for these species. It would also likely affect riparian nesting species, such as the southwestern willow flycatcher and least Bell's vireo, due to the change in vegetative

composition. This would lead to a degradation of nesting habitat which could eventually result in a loss of suitable nesting habitat.

The no action alternative would affect the availability of forage and water for many species, which could be detrimental to the existing populations. As water amount and distribution is affected by the presence and spread of invasive plants, these invasive plants would also affect the availability of water for many species, especially during the warmer months and under drought conditions.

As invasive populations get denser, they would change the habitat suitability for reptiles which need exposure to the sun for thermoregulation. Some species such as the San Diego coast horned lizard rely on openings for foraging and would be negatively impacted by dense infestations of invasive plants. The spread of invasive plants may also affect the availability of native food species, such as insects, which are associated with native plants. Overtime, these conditions would lead to changes in populations. Severe infestations could affect distribution across the landscape.

The no action alternative would also affect bat species with the changes in plant species and water availability. Flat surface water is important for bats that rely on it daily for hydration. Additionally, many bat species forage over water where insects are plentiful. The changes in water flow caused by invasive plant populations would affect foraging habitat especially during the dry months, leading to a decrease in the amount of foraging habitat. Native insect production would be adversely affected as the habitat composed of invasive nonnative species increased.

Alternative 2, Proposed Action, Specific to Herbicide Treatment Methods

This section addresses direct and indirect effects to general wildlife species specifically from herbicide treatment, realizing herbicide treatments would be used in combination with other treatment methods. One of the issues brought up during scoping was the potential impact from the use of herbicides to aquatic organisms, mammals, and birds. Multiple layers of caution have been built into the proposed action and the analysis of effects. The SERA Risk Assessments were utilized along with other assessments and studies, which evaluated these same herbicides and risks, to analyze effects. State and Federal laws, EPA approved label requirements and advisories, treatment methods appropriate to local needs, project design features, implantation with compliance monitoring, adaptive management, as well as the worst case scenarios in SERA and other analyses, all contribute to the layers of caution built into the proposal.

General Wildlife

Direct effects associated with herbicide use may occur as the result of unintentional direct spray and accidental spills particularly in or near water. Although both unintentional direct spray and accidental spills have the potential to occur, stringent project design features have been incorporated to reduce the likelihood of these events. Unintentional direct spray would not likely occur because the presence of personnel applying herbicides in treatment areas would cause most wildlife to temporarily disperse from the area. Some reptile species, however, may remain in the area taking cover under vegetation leaving individuals at slight risk to direct spray. If direct spray to reptiles does occur, the vegetative cover would act as a barrier decreasing the amount of herbicide spray that comes in contact with reptiles. The risk of an accidental spill is also low due to the guidelines outlined in the herbicide transportation, handling, and emergency spill response plan which is part of the proposed action (alternative 2).In addition, design features have been added to reduce risks. If an accidental spill or unintentional direct spray occurs on wildlife, there is the potential of adverse effects occurring. Worst case, adverse effects could include, but are not limited to, changes in internal organ functions or complete shut-down of organs, offspring that develop physical abnormalities, and mortality of the individual exposed. Effects would vary based on the herbicide, amount and concentration of herbicide used, size of the animal exposed and in the case of an accident spill in water, how long it would take the herbicide to become diluted. The risks are low because of the project design and several design

features (e.g. only target herbicide treatment methods would be used with no broadcast spraying, only daily use quantities of herbicides would be transported to the work site [except in wilderness areas], impervious material, such as a bucket or plastic, would be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling).

Indirect effects as a result of herbicide application are more likely to occur and are a higher risk to wildlife than direct effects. Indirect effects include consumption of contaminated vegetation and/or prey, contact with contaminated vegetation and soil, and consumption of contaminated water. All of these effects may occur to wildlife in the area after treatment. The effects of the herbicides varies based on the herbicide, the concentration of herbicide used, weight of the animal, amount of contaminated material consumed and duration of consumption, that is, consumption in a single incident or over multiple days. The risk to wildlife is based on the toxicity of the product and how it affects the species. A summary of the risks for each of the proposed herbicides to FS Sensitive or T/E wildlife can be found in the biological evaluation and biological assessment. All risk information is taken from the SERA Risk Assessments (SERA 2003 a, b, 2004 a, b, 2007b). Based on the risk assessment worksheets completed for the project, at the highest application rates, generally, all major wildlife groups would be impacted below the level of concern[29] for aminopyralid, chlorsulfuron, and imazapyr. A general summary of finding of potential impacts to major wildlife groups from the use of the herbicides is provided:

Mammals and Birds

- When herbicides pose a plausible risk, it is consistently to insectivorous and grass-eating animals because they are most likely to receive doses above the toxicity index.
- Fish-eating birds do not receive a dose above the toxicity index for any of the five herbicides at the application rates ranges.
- Consumption of contaminated water, even as the result of an accidental spill, results in doses well below the toxicity index for all five herbicides.
- Birds are less sensitive than mammals to acute exposures.

Reptiles

- There are no specific studies on reptiles for any of the herbicides proposed. Data on amphibians and fish are used as a reference. Based on this interpolation, toxicity levels to reptiles from direct spray or contact with treated plants are expected to be lower since reptile skin is less permeable than fish or amphibians.
- Risk of herbicide affecting reptiles can be through direct spray, contact with contaminated soil and vegetation, ingestion of contaminated prey.

Amphibians

- Less sensitive or about as sensitive as fish to some herbicides.
- There have been no separate dose-response assessments conducted; fish assessments apply.
- No data regarding toxicity for chlorsulfuron or imazapyr, however, data for other aquatic species shows low potential to cause adverse effects.
- Can reduce risk by applying during non-breeding season or not during larval development stages.

[29] **Level of Concern (LOC)** - The concentration in media or some other estimate of exposure above which there may be effects. See R-6 Invasive Plant Toolbox Glossary.

Fish

- Salmonids are generally more sensitive to herbicides than other fish species.
- Toxicity to fish is based on bioconcentration levels found in fish tissues.
- Generally, surfactants (e.g. POAE) added to glyphosate are more toxic than glyphosate itself.

Presently the project area does not have vast areas of invasive weeds and herbicide treatment is one of many options for this alternative. The herbicide that is typically higher risk to wildlife (i.e., triclopyr) has restrictions on use through various design features that were intended for human health and safety, but wildlife would also benefit: in areas where the public can consume vegetation where herbicides would be used, the vegetation would be cut prior to herbicide treatment, and triclopyr would be the lowest priority herbicide applied and would only be used if the other approved herbicides are not effective in treating a specific invasive plant. Multiple design features are included specific to triclopyr and protection of aquatic species. These design features will greatly reduce the risk to aquatic species and human health.

Alternative 2, Proposed Action

Special Status Wildlife Species

Southwest Willow Flycatcher and Least Bell's Vireo (Endangered)

Implementation of proposed treatment methods included in Alternative 2 would have no direct effects on southwestern willow flycatchers or least Bell's vireo. Treatments, including restoration activities, would not occur in suitable habitat during the breeding season unless protocol surveys document that southwestern willow flycatchers and least Bell's vireo are absent.

This design feature would reduce the potential for project activities to result in direct effects to these two migratory species. Southwestern willow flycatchers have not been documented as nesting on the Angeles National Forest. There are observations of willow flycatchers on the Forest during the early spring, but these birds have not been confirmed as southwestern willow flycatchers. Based on timing of these observations, it is believed these individuals are willow flycatchers and not the federally protected southwestern willow flycatcher. In addition, there have been sporadic sightings of least Bell's vireos during the breeding season on San Francisquito Creek, Big Tujunga Creek, and the upper Santa Clara River (U.S. Fish and Wildlife Service, 1998). However, breeding has not been documented at any of these locations. There has been documented nesting in the lower Santa Clara River outside of the National Forest boundary. In 2011, nesting was confirmed on the Forest immediately below the dam at Littlerock Reservoir on the north end of the Forest, just to the east of the Santa Clara watershed.

For all proposed treatment methods, the potential for direct impacts to wildlife species exists only if southwestern willow flycatchers and least Bell's vireo are present in the project area during treatment activities. As stated previously, restrictions on treatments in suitable habitat during the nesting season eliminates the potential for impacts to breeding for these two bird species. If southwestern willow flycatchers and/or least Bell's vireos were to utilize the project area during migratory movements, there is a small potential for their occupancy to overlap with project implementation. In that case, project activities could flush or displace roosting or foraging birds. If the birds consume glyphosate and/or triclopyr-contaminated insects at a high rate for a period of time, they are susceptible to toxicity levels that exceed the level of concern. The highest application rate of glyphosate to be used for this project is 8 pounds per acre. This application rate may result in adverse affects to flycatchers or vireos if they consume large amounts of contaminated insects in a short period of time. The project proposes a typical application rate of 3 pounds per acre for glyphosate. At this rate, no adverse effects are expected to occur to flycatchers or vireos based on the glyphosate worksheets completed for this project (USFS 2010c). The design features limit the use of glyphosate and triclopyr to 3 pound a.e. per acre within 100 foot of occupied streams for aquatic species. The same is also true when using

triclopyr. This should also reduce any potential effect to flycatchers and vireos as the best habitats overlap with the fish and amphibian species. Triclopyr BEE and triclopyr TEA pose a risk to insectivorous birds when used at the high application rate of 10 pounds per acre and at the upper level of exposure. If flycatchers or vireos consume large amounts of triclopyr-contaminated insects over a short period of time, mortality is likely to occur based on the triclopyr worksheets completed for this project (USFS 2010e and f). At the typical rate of 3 pounds per acre, no adverse effects are expected to occur. These potential adverse effects are unlikely because of the methods proposed for treatment activities and the lower application rates. Treatments would occur via a backpack sprayer for foliar/spot spraying applications or they would occur directly to the stumps of target species after they have been cut. No broadcast applications would occur, decreasing the amount of herbicides applied at the landscape level. Also, treatments to the high priority invasive plants found in riparian habitat would likely occur in late summer to early fall when flycatchers and vireos are passing through as they migrate to winter grounds. Based on the avoidance of treatments in suitable habitat during the nesting season and the low likelihood of migratory southwestern willow flycatchers and least Bell's vireo in the project area for any length of time, the above described impacts are not expected or are expected to be negligible.

The removal of invasive plants through biological control methods, manual/mechanical treatments, fire wilting and herbicide treatments as well as restoration activities would alter vegetative structure in areas that are treated. In areas where tamarisk is present and contributes to the suitability of nesting habitat to southwestern willow flycatcher(s) or least Bell's vireo present at the site, a design feature prevents a net reduction of more than 20 percent of the suitable habitat within the projet area annually. Removal of invasive plants would prevent further spread, reduce the risk for new infestations and would allow native riparian species to become re-established. Removal or reduction of invasive plants in suitable southwestern willow flycatcher habitat would allow for native riparian communities to provide the best habitat conditions possible. Monitoring activities after initial treatments would determine if areas need additional treatment. This would prevent further spread of invasive plants and maintain treated areas. Removal of invasive species from suitable southwestern willow flycatcher and least Bell's vireo habitat would improve habitat conditions for this species over time.

The proposed action (alternative 2) is not expected to adversely affect southwest willow flycatchers or least Bell's vireo. Eradicating and controlling invasive plants should greatly benefit these species in the long-term.

Unarmored threespine stickleback (federally endangered), arroyo Toad (federally endangered, California red-legged frog (federally threatened), Santa Ana sucker (federally threatened, but introduced), southwestern pond turtle, and two-striped garter snake (Forest Service Sensitive), Santa Ana speckled dace and arroyo chub (Forest Service sensitive,but introduced)

By avoiding stream entry wherever possible, restricting the use of herbicide treatments within 100 feet of the streambank of these species' occupied or critical habitat during the spawning or breeding season, and preventing the removal of emergent and streambank vegetation during the spawning/breeding season, there would be no direct impacts to spawning and reproductive success. Hydrology design features that minimize impacts to streams and riparian habitat would also help protect fish. With the incorporation of all of these design features which will insure that herbicides do not get in the streams, Santa Ana suckers, arroyo chub, and Santa Ana specked dace occupying the stream are unlikely to be directly impacted by any of the methods listed in the proposed action.

The worst case effects from a large accidental spill could result in mortality to individual fish, frog or toad or damage to the eggs or offspring, especially in areas where the fish or egg masses cannot escape exposure. The effects depend on many variables including, but not limited to, how much and

which herbicide is spilled, the concentration of the herbicide, and how quickly the herbicide is diluted based on rates of flow and the gradient of the stream. There are several design features that significantly limit the amount of herbicide that could ever get to water even in a worst case spill. Design features on mixing, loading, washing, cleanup, transportation of herbicides and maximum reduce this risk greatly.

There is a design feature that requires only the aquatically labeled formulations of glyphosate, imazapyr and triclopyr and low-risk aquatically approved surfactants within 100 feet of banks and tributaries (with an added restriction of no triclopyr BEE treatment within 150 feet from banks of occupied habitat). There is a restriction of no triclopyr BEE treatment in the floodplain.

In addition, some high concentrations of glyphosate and triclopyr are toxic to fish. A design feature restricts the amount of this herbicide to no greater than three pounds a.e. per acre within 100 feet of the stream if surface water is present. These design features would ensure the herbicide use near water is below the level of concern for the aquatic animal species.

Biological control methods, manual/mechanical treatments, fire wilting treatments, and restoration activities are unlikely to indirectly affect the three special status fish species. Herbicide treatments, however, could indirectly adversely affect these aquatic species as a result of herbicide spray drifting into the water during applications. Adverse effects include behavioral changes such as lethargic or hyperactive fish, and mortality due to behavioral changes in fish. Pond turtles, two-striped garter snakes, arroyo toad and red-legged frog can get out of the water or come to the surface to avoid any herbicide which gets to the water. Of the herbicides proposed for use, two pose this risk (i.e., pre-mixed glyphosate [e.g. Roundup®] and triclopyr BEE). Two design features prevent this from occurring. A design feature restricts the application of glyphosate and triclopyr within 100 feet from the surface of water if the application rate exceeds 3 pounds per acre. In addition, there is a design feature that only allows aquatically labeled glyphosate and triclopyr, and low-risk aquatically approved surfactant be applied within 100 feet of banks of ponds, flowing rivers and tributaries. There are no products for Triclopyr BEE and pre-mixed glyphosate that are aquatically labeled. In addition, triclopyr BEE has a larger no treatment buffer of 150 feet from banks of rivers and tributaries adjacent to occupied habitat. A design feature includes keeping any herbicide drift from reaching any water, so any drift problem would be accidental and extremely rare. These design features would ensure the herbicide use near water is below the level of concern for fish and other aquatic species.

Surfactants are not expected to have adverse impacts to the special status aquatic species. As noted earlier, a design feature requires only low-risk aquatically approved surfactants (e.g. Agri-Dex, ® Class Act NG, ® Dyne-Amic®, Competitor®) be used within 100 feet of the banks of ponds, flowing rivers and tributaries. Surfactants (such as POEA) that are higher risk to aquatic species (e.g. R-11®) would not be allowed in these areas.

The adverse impacts from implementing this alternative, including the design features, are low. A beneficial indirect effect with the eradication and control of invasive plants would be improved habitat conditions in the long-term. In some areas, invasive plants have overtaken waterways, and changed the hydrology of streams and creeks as previously described in this document. The eradication and decrease of invasive plants would allow native plants to re-populate especially in riparian areas which would help to restore streams to a natural state. Restoration and monitoring are also part of the proposed action and these activities would ensure invasive plants do not become re-established in treated areas.

California spotted owl (Forest Service Sensitive)
Biological control methods, manual/mechanical treatments, herbicide applications, fire wilting and restoration activities are unlikely to directly affect California spotted owls. All activities would occur

during the day when owls are roosting. Noise generated by project activities would consist mainly of personnel and vehicles entering and exiting the area. Treatments would occur in foraging habitat. Little to no treatment is expected to occur in roosting and nesting habitat, minimizing adverse impacts to owls. Pile burning associated with the removal of invasive plants would not be located in roosting or nesting habitat and is not likely to affect spotted owls. Some rodents that have consumed treated vegetation could be eaten by spotted owls, but the levels of herbicide should not adversely affect owls.

Biological control methods, manual/mechanical treatments, fire wilting treatments and restoration activities would not indirectly affect spotted owls or their roosting and nesting habitat. It is expected that little to no treatment would occur in nesting or roosting habitat. In addition, based on the risk assessments, none of the herbicides applied at typical or high application rates are expected to result in an effect above the level of concern.

None of the proposed treatment activities would degrade suitable habitat for spotted owls. In the long-term, foraging habitat may be improved with the removal of invasive plants. Habitat conditions for some prey species of spotted owls may improve as invasive plants are eradicated, allowing native vegetation to become re-established. Restoration and monitoring activities would also determine if additional treatments are needed and would prevent invasive plants from re-colonizing treated areas.

Bald Eagle (Forest Service Sensitive)
Herbicide treatments are unlikely to directly affect bald eagles. Little to no herbicide treatment is expected to occur in roosting and nesting habitat, minimizing adverse impacts to bald eagles. Herbicide treatments would likely occur near bald eagle foraging habitat around manmade reservoirs. Herbicide treatments are not expected to affect prey species (fish and waterfowl) affect so ingestion of *prey* is not expected to adversely affect the bald eagle. . Based on the risk assessment prepared for this project, none of the herbicides applied at typical or high application rates are expected to result in an effect above the level of concern.

Biological control methods, manual/mechanical treatments, fire wilting treatments and restoration activities are unlikely to directly affect bald eagles or peregrine falcons. It is unlikely these treatment activities would occur in areas where either species is typically found. Noise generated by project activities would consist mainly of personnel and vehicles entering and exiting the area and is expected to have little effect to either species. As with herbicide use, little to none of the other treatment methods is expected to occur in roosting and nesting habitat, minimizing potential adverse impacts to bald eagles. As with herbicide treatments, non-herbicide treatments would occur near bald eagle foraging habitat.

None of the proposed treatment activities or restoration activities would degrade suitable habitat for bald eagles. In the long-term, implementation of this alternative would likely benefit foraging species. This effect would help maintain the availability of prey for the bald eagle.

Yellow-Blotched Salamander, California Legless Lizard, San Bernardino Mountain Kingsnake. San Bernardino Ringneck Snake, San Diego Horned Lizard, Coastal Rosy Boa. (Forest Service sensitive)

Biological control methods, manual/mechanical treatments, fire wilting treatments, herbicide application activities, and restoration activities may affect individual amphibians and reptiles due to the presence of personnel and vehicles in the area. Direct impacts may include injury or mortality as a result of vehicles and pedestrians crushing individuals within the project area. Short-term displacement and/or disturbance of feeding and breeding activities due to noise, vibration, and project associated activities are other possible direct effects.

The herbicide risk assessments do not include any specific data regarding the toxicity of herbicides to reptiles. The assessments use toxicity data for fish and amphibians as guidance for risks to reptiles. It is expected that the actual toxicity of direct contact to reptiles is lower than what is given for fish and amphibians since reptiles have skin that is less permeable. Based on the risk assessments for this project, two of the five herbicides proposed for use may pose a risk to fish, amphibians and reptiles. The application of triclopyr BEE and pre-mixed glyphosate have a low risk of directly impacting amphibians and reptiles. Although most amphibians and reptiles would flee the area when personnel, vehicles and equipment are in the area, some may take cover and refuge under vegetation. Amphibians and reptiles under vegetative cover are at risk of being directly sprayed by herbicides. If this occurs, the vegetation would provide some protection and reduce the risk that 100 percent of any animal's body would be exposed to herbicide spray. If direct exposure does occur, it can result in mortality to adults and the offspring of exposed adults to produce young that have physical abnormalities. This risk is decreased through the application methods to be used. Treating with herbicides would occur by focused treatment (e.g. cutting the plant and daubing the stump with the herbicide) or it would be applied to the foliage of target plants using a backpack sprayer. These techniques would decrease the amount of spray that may drift from the area, keeping the application localized to target plants. To further reduce potential drift a design feature restricts herbicide application when winds are greater than 10 miles per hour. No broadcast applications would be used in applying herbicides for this project. A design feature also restricts the use of triclopyr to occur only when other approved herbicides are not effective in treating a specific invasive plant species. Based on this analysis and the design features, the risk of direct exposure of triclopyr BEE and pre-mixed glyphosate to amphibians and reptiles is low.

Indirect effects of herbicide treatments may include, but are not limited to, the consumption of contaminated prey, and contact with contaminated vegetation and soil. There is potential for all of these to occur in treatment areas. Indirect effects may have adverse impacts on reproduction, such as mortality of young, and the development of physical abnormalities as amphibian larvae mature. Reptiles in the project area may return shortly after treatment making them susceptible to exposure to herbicides. Two of the five herbicides proposed for use pose a risk if applied at a high application rate. Glyphosate would be applied at a typical rate of 3 pounds per acre with the highest application rate of 8 pounds per acre. Based on the project worksheets assessing risk, both rates with the pre-mixed glyphosate would exceed the level of concern for amphibians and reptiles (USFS 2010c) under short-term exposure. There is little risk the herbicide would cause adverse effects under long-term exposure. Triclopyr BEE poses a risk to amphibians and reptiles when applied at the highest rate of 10 pounds per acre and the typical rate of 3 pounds per acre under short-term exposure. There is little risk of adverse effects at the same rate under long-term exposure. As noted earlier, high and moderate priority invasive plants in the project area presently do not cover vast areas and there are other treatment methods besides herbicide treatment. The type of herbicide treatment methods would also help to minimize risk to amphibians and reptiles. Herbicide application would be localized, by treating target species using a backpack sprayer for foliar/spot spraying application or by focused treatment such as daubing the stumps of target species after they have been cut. No broadcast applications would occur, decreasing the amount of herbicides that may drift at the landscape level. A restriction on treatment during winds greater than 10 miles per hour would also reduce the risk for drift. Triclopyr will only be used if other approved herbicides are not effective in treating a specific invasive plant. The adverse indirect impacts to these species from the use of pre-mixed glyphosate and triclopyr BEE are low to moderate.

Pile burning may affect some amphibians and reptiles if they are using the piles as habitat. A design feature, which includes burning the piles as soon as possible and disturbing piles prior to igniting them would help decrease adverse effects to individuals.

Indirect effects due to manual/mechanical and fire wilting treatments, and restoration activities would have little effect to reptiles in the area. The treatments would result in a change in vegetative structure, which may remove some cover for reptiles. At the same time, treatment activities may result in an increase in basking areas. There are areas where patches of invasive plant species are too dense for most animals including amphibians and reptiles, to move through, forage or thermoregulate. Removal of these patches of invasive plants would provide openings that are currently non-existent. Over time, it is anticipated native plants would become re-established naturally or through restoration activities in treated areas, which would provide natural structure and cover levels, a beneficial effect for reptiles.

Pallid Bat, Townsend's Big Eared Bat and Western Red Bat (Forest Service sensitive)
Biological control methods are unlikely to affect bats in the area. Other treatment activities such as manual/mechanical treatments, fire wilting treatments, herbicide application activities and restoration activities may affect individual bats due to the presence of personnel and vehicles in the area. Western red bats utilize the foliage of riparian hardwood trees for roosting and pallid bats would sometimes roost in tree hollows. If individuals are roosting in the immediate vicinity of the treatment area they may be disturbed by the noise and human disturbance generated by project activities. This could result in temporary displacement of individuals. Impacts resulting from displacement would be greatest during the maternity and the winter roosting seasons.

There are historical records of western red bats roosting in tamarisk. Unpublished field notes by S. Benson, documented western red bats roosting at heights of 6 to39 feet in large tamarisk stands that were 39 to 49 feet in height (Pierson et al. 2006). Tamarisk is a high priority species targeted for removal in the project area. Pruning and cutting of this plant may adversely impact roosting bats, but it is more likely disturbance activities would cause bats to leave their roost before treatment activities begin. In addition, roosting habitat should not be a limiting factor in this watershed.

Biological control methods, manual/mechanical treatments, fire wilting treatments and restoration activities would not indirectly affect bats or their roosts. Herbicide treatments may indirectly affect bats if they consume contaminated insects and may affect red bats with the potential loss of roosting habitat in areas where larger sized tamarisk are removed. However, native riparian vegetation would be available providing suitable roosting habitat for red bats that may be utilizing tamarisk as roost sites. If bats consume a large quantity of insects contaminated with glyphosate, imazapyr or triclopyr, it could result in adverse effects. The risk of glyphosate to bats may occur at the typical application rates proposed for this project. Short-term exposure would result in adverse effects. Imazapyr may cause adverse effects to bats if they consume a large quantity of contaminated insects at the high application rate (4 pounds per acre) over a short period of time. It is unknown if chronic exposure causes any risk because there are no studies documenting degradation of herbicides in insects. Therefore, there is no chronic exposure data available for insectivorous species. At the typical application rate proposed for this project, triclopyr may cause adverse effects (mainly diarrhea) if bats consume contaminated insects over a short period of time (USFS 2010e-f). Although there is a risk to bats, the risk would be low because bats tend to forage over large areas. It is unlikely that they would consume large quantities of herbicide-contaminated insects. In addition, high and moderate priority invasive plants presently do not cover vast areas of the project area and herbicide treatment is one of many methods being considered. The type of herbicide treatment (i.e., foliar or spot spraying and focused treatment) would further reduce the risk of accidentally treating insects. Triclopyr is also restricted for use only when other approved herbicides are found to be ineffective in treating specific invasive plant species. These factors along with the noted project design features would minimize the adverse impacts to bat species noted earlier and are anticipated to be low.

Management Indicator Species (Effects for Alternatives 2 and 3)

MIS plant populations are not expected to be adversely impacted under Alternative 2 or 3. In fact, the removal of non-native invasive plants is likely to benefit all native vegetation, including all MIS plant populations over the long term. There may be some instances where individuals may be crushed, injured, or potentially killed due to an accidental spill, or other situation. However, this potential is very low considering the project design features. Over the long term, this project is likely to restore native vegetation populations, and benefit all MIS species.

For wildlife MIS, the project is most likely to impact individuals by temporary displacement due to disturbance. Similar to the MIS plant species, there is some potential for individuals to be crushed, injured, or potentially killed due to project activity. However, the likelihood of this happening is low. On the contrary, there is a high likelihood that this project will benefit native vegetation and habitat types on the forest, including habitats associated with the forest MIS species.

The goal of this project is to eradicate, control, contain, and/or suppress existing invasive plant species in the Santa Clara River and its tributaries from the forest boundary to their headwaters. Therefore, the long term effect of this project would benefit all native habitat types on the forest. Any impacts to MIS species are expected to be short-term and localized to individuals.

Alternative 3, No Herbicides

Alternative 3 would treat invasive plant species, but without the use of herbicides. Treatment would likely be less effective, require more effort and entries, and cost more. Without the use of herbicides, the short-term risk to wildlife would decrease; however, for most low and moderate priority invasive plant species, they would continue to survive and spread similar to the no action alternative. This would have a long-term adverse effect on native wildlife.

Alternative 3 would help to control some populations of invasive plants (i.e., high priority species), but it would require more entries. This would lead to an increase of disturbance to wildlife species with the presence of personnel and vehicles in the area. The disturbance would be short-term, but at higher intervals than in the proposed action. It is likely that some of the effects to wildlife that may occur with alternative 1 would also apply to alternative 3. Complete eradication of invasive plant populations is unlikely and spread of many invasive plants would be at a similar rate. This is especially true for those species in which herbicides have been found to be the one effective method of eradication. Other treatments would help to control the population, but the effect is temporary.

Herbicides do pose a risk of minor, short-term adverse effects occurring to wildlife species as described in the wildlife effects section for alternative 2. Since alternative 3 does not propose herbicide treatments, alternative 3 would have less potential short-term adverse impacts to wildlife from herbicides in comparison to alternative 2. Disturbance effects would be greater under alternative 3 due to the need for more entries and ground disturbance.

Overall, alternative 3 would help to remove invasive plants, however, over time, low and moderate priority populations would continue to spread leading to long-term adverse effects to suitable habitat for many wildlife species.

Cumulative Effects

The cumulative effects spatial boundary considered in this analysis is the Santa Clara watershed within and adjacent to the Angeles National Forest. The temporal boundary is 15 years, the life of the project.

Alternative 1, No Action

As with all resources, there would be no cumulative effects from alternative 1 to wildlife.

Alternative 2, Proposed Action

The proposed project would cumulatively increase adverse effects in the short-term when reviewed with other projects/activities. Invasive plant removal on the Santa Clara/Mojave Ranger District has been focused on the removal of arundo and tamarisk. The proposed project would expand the number of priority species to be removed and as a result would also increase the amount of area to be treated. Disturbance from treatment activities would be short-term and would be due to the presence of personnel in suitable habitat and the potential contamination of vegetation and soil from herbicide treatments. In the long-term, the proposed action would improve and maintain habitat conditions for wildlife. Implementation of the design features should result in very little effect on wildlife.

Activities such as recreation use and the presence of dams and reservoirs and road maintenance projects would have a continued impact on wildlife in the area. Activities on non-national forest lands could also impact wildlife. Wildlife is used to the activities associated with recreation and road maintenance on national forest lands as they have been occurring for years and on a regular basis. The dams and reservoirs in the project area have been present for years and wildlife is use to the presence of these structures and the activities affecting them. Wildfires are also likely to occur over the next 15 years and would continue to impact wildlife species by altering and removing suitable habitat. This project would not contribute toward the cumulative impacts of wildfire to wildlife species. Other activities that involve vegetation management and the proposed project would cumulatively affect wildlife habitat as it would improve existing conditions in the future.

Alternative 3, No Herbicides

Cumulative effects for alternative 3 would not cumulatively increase adverse effects to any extent. There would be minor increases in human disturbance for the short time that the treatment takes place. The lack of herbicide use in alternative 3 would decrease potential risk to wildlife in the area and the adverse effects associated with herbicide risks. Lands adjacent to the project area may include treatment of invasive plants by a variety of methods. These areas, along with alternative 3, would cumulatively increase the beneficial effects of removing invasive plant populations. However, as described in the effects section for alternative 3, the results in controlling moderate priority species would likely not be effective in the long-term. The benefits arrived from the use of herbicides in alternative 2 would not be as great and the cumulative beneficial effects would be less.

Soil and Water Resources

Affected Environment

The project area includes the major drainages and subwatersheds in the upper Santa Clara River watershed including, Bouquet Canyon, San Francisquito Canyon, Elizabeth Lake Canyon, Fish Creek, Castaic Creek, Piru Creek, Oak Spring Canyon, Bear Canyon, Soledad Canyon, and Arrastre Canyon subwatersheds.

The San Gabriel and Sierra Pelona Mountains are young mountain ranges which are still being affected by ongoing tectonic activity. Mountain slopes are generally steep with sharp ridges. Streams are in narrow canyons with steep gradients. Channels are carved into bedrock or lined with gravels, cobbles, and boulders. Occasional reaches with lower gradients may contain some sands. Periodic flooding after significant precipitation events is common. These floods move large volumes of sediments of all sizes down the stream channel. Channels are generally free of large vegetation due to these floods, which scour vegetation from the channel when they occur.

Few areas are wide enough to contain much of a floodplain and these are generally in the lower reaches of the drainages. Other reaches may have stream terraces which have been uplifted by tectonic forces beyond the reach of flood events. Floodplains and stream terraces are often the locations for denser stands of invasive plant species. Floodplains may be scoured clean of most

vegetation during flood events, leaving little competition for invasive plant species which generally colonize disturbed areas rapidly. Floodplains and terraces also contain shallow groundwater which is readily available to invasive plant species.

Some perennial stream reaches near the mouths of the tributaries of the Santa Clara exhibit a wide, rocky channel. Normal stream flow does not occupy the entire width of the channel, leaving broad, rocky floodplains adjacent to the active channel. Floodplains, stream terraces, and exposed shorelines of reservoirs and lakes are also designated as wetlands by the US Fish and Wildlife Service National Wetlands Inventory http://www.fws.gov/wetlands/. These areas often contain invasive plant species and are a primary focus of the proposed treatments.

The coarse nature of the channel substrate and adjacent floodplains and stream terraces allow rapid infiltration of precipitation or other fluids, such as herbicides.

Water quality in the various streams is generally good, except during high flows when turbidity and suspended sediment concentrations increase and in areas of heavy recreational use which may add trash and bacteria to the water. Portions of the downstream Santa Clara River are included in the list of streams with impaired water quality as well as Piru Creek and Mint Canyon. None of these water quality problems are related to activities in this proposal

The soil characteristics are generally shallow with moderately rapid infiltration. Precipitation would infiltrate rapidly but available storage in the soil is limited and surface runoff may start relatively quickly. Rock outcrops also cover portion of the treatment areas. Rock outcrops are typically barren with soils capable of plant growth covering less than 15 percent of the area. Their runoff potential is typically very high.

The Santa Clara River is in the Los Angeles Regional Water Quality Control Board Jurisdiction. Contact was made with the Board and multiple downstream water agencies. Since the project is designed to keep herbicides out of water, there were no negative concerns expressed. In general there was support from these agencies to control invasives that degrade the watershed.

Environmental Consequences

Direct and Indirect Effects

Alternative 1, No Action Alternative

Under this alternative, invasive plant species would continue to spread and increase occupation of riparian habitat and other areas. Tamarisk and arundo are especially invasive and can rapidly form dense stands along stream channels and on floodplains. Tamarisk species have very long tap roots which can access shallow groundwater. Dense stands of tamarisk can reduce streamflow by direct water usage and by lowering groundwater levels. Arundo also forms dense stands and uses large volumes of water to support its rapid growth rates. Unimpeded growth of tamarisk and arundo could result in a decrease of stream flows, especially in smaller drainages (Muzika 2005, Benton 2005).

Typical stream behavior in this area includes floods of various sizes which mobilize sediments and clear much of the vegetation from stream banks and floodplains. Dense stands of arundo or tamarisk can also affect stream morphology by unnaturally stabilizing stream banks, islands, sand bars, and floodplains. Tamarisk seeds and arundo roots/stalks (propagules) can also be transported downstream during flood flows to colonize other areas.

Water quality can be affected by these invasive plant species. A potential beneficial effect is that water temperature could be reduced as the increased shade from the invasive plant species provides shade. Tamarisk species have the ability to take up salts present in water and excrete it in their leaves. When these salts build in soils beneath tamarisk stands, soil productivity is reduced and

growth of other plant species is suppressed. These salts can also reach surface and groundwater through runoff or infiltration.

Many of the invasive plant species are highly flammable, especially tamarisk and arundo. As these species increase, they can affect the wildland fire regime by increasing fire severity and decreasing the return interval. As noted earlier in this document, this has adverse impacts in riparian areas which generally burn at lower fire severity than upland areas. Increased fire severity has negative impacts on soils including hydrophobicity (water repellency), which reduces infiltration; changes in soil structure; and destruction of soil biota. Following wildfires, the first few years of rain would erode and transport ashes, nutrients, and sediments to the streams within the fire perimeter with a resultant decrease in water quality. This was seen in the areas burned by the Station and other fires in the watershed. The reduced amount of vegetation on hillslopes allows more runoff and sediment transport which would increase water supply to the streams, with the potential for flooding and mud flows, which occurred in cities downstream of the Station fire after the January 2010 rains.

Excluding wildfire events, this alternative would result in long-term, adverse (reduction in water supply) and minor beneficial (maintenance of water temperatures) effects within riparian corridors in the Santa Clara River watershed. Including wildfire effects, this alternative would result in adverse effects to water quality and quantity, soil structure, and the soil biological community.

Alternative 2, Proposed Action, Specific to Herbicide Treatment Methods

This section addresses direct and indirect effects to soils and hydrology specific to the use of herbicides. Herbicide treatment methods would likely include other treatment methods (e.g. cut and daub). Impacts from non-herbicide activities are addressed in the next section.

The use of herbicides within riparian areas is of concern due to the potential introduction of toxic chemicals into streams. Many of the treatment areas are along stream channels and many of the invasive plant species grow along active channel banks or even within flowing streams. Thus, herbicides may be applied where they can quickly enter streams. Streams in the project area are in narrow canyons with limited floodplains, where many of the invasive plant species grow. A design feature is included in this alternative that requires that only the aquatically labeled formulations of glyphosate, imazapyr, and triclopyr along with the extremely safe Aminopyralid be allowed within 100 feet of banks of flowing rivers and tributaries. Chlorsulfuron can only be used beyond 25 feet from a water body or flowing stream edge. Another design feature restricts Triclopyr BEE from use in floodplains of any intermittent or perennial stream.

Herbicides are typically used with adjuvants, compounds which enhance the capability of the herbicide to stick and spread over vegetation and to penetrate into plant tissues. Adjuvants vary in toxicity and few studies have been conducted on their behavior in the environment. A design feature requires low-risk and aquatically approved surfactants be used within 100 feet of the banks of flowing rivers and tributaries. In addition, since any adjuvant used would be mixed as a small percentage of an herbicide, the effects on the environment, including soils and water quality would be considered the same as the herbicide (Bakke 2007).

Herbicide characteristics that affect their behavior and persistence in the environment include solubility in water, degradation rates in soils and water, leachability, and adsorption onto soils. Table 12 shows the proposed herbicides and pertinent physical and chemical characteristics. The information provided in table 12 was taken from the SERA human health and ecological risk assessments (SERA 2003a, b; 2004 a, b; 2007b) and other sources.

Herbicides vary in their toxicity to non-target organisms, such as soil microbes, herbivores, and aquatic plants and organisms. Some highly toxic herbicides have formulations which have lower toxicity to terrestrial and aquatic organisms, including forms of glyphosate, imazapyr, and triclopyr.

Aminopyralid and chlorsulfuron have very low toxicity to terrestrial and aquatic life, but chlorsulfuron poses a greater risk of impacting groundwater. (SERA 2003a, b; 2004a, b; 2007b).

Table 12. Herbicide Behavior in the Environment.

Chemical and Product Names	Suitable for Aquatic Use?	Fate in the Environment	Hazards	Toxicity to Non-Target Organisms	Leaching Potential	Solution Runoff Potential	Adsorbed Runoff Potential
Aminopyralid	No	Highly soluble in water and mobile in soils. Degrades rapidly in water. Relatively stable in soils. Unknown if toxic to soil microorganisms.	New herbicide, limited toxicity information available. Can leave residues in soil. May leach to groundwater.	***Very low***	High	Low	Low
Chlorsulfuron	No	Microbial and chemical degradation are relatively rapid. Potential for offsite movement through drift, runoff, or wind erosion. Relatively non-toxic to soil microorganisms.	Can leave residues in soil for several weeks. May leach to groundwater.	***Low***	High	High	Intermediate
Glyphosate	Yes (Aquamaster® formulation only)	Adsorbs tightly to soils. Subject to rapid microbial degradation. Non-toxic to soil microorganisms. Low drift potential.	Should not be used prior to predicted rainfall. May require re-treatment.	***Low to Moderate***	Very low	Low	High
Imazapyr	Yes (Habitat® formulation only)	Highly mobile in sandy soils. Potential for offsite movement through drift, runoff, or wind erosion. Degrades rapidly in water and slowly in soils. Relatively non-toxic to soil microorganisms.	Can leave residues in soil. May leach to groundwater.	***Low to Moderate***	High	High	Intermediate
Triclopyr	Yes (triclopyr triethylamine salt formulation only [TEA])	One formulation very persistent in the environment. Other formulation degrades rapidly. Potential for off-site movement through drift, runoff, and wind erosion. Relatively non-toxic to soil organisms.	One formulation may leave residues in soils. Either formulation may leach to groundwater. Ethyl ester formulation may contain kerosene as an adjuvant.	***Low to Moderate***	High	Intermediate	Intermediate

Overuse or careless use of herbicides can produce short to long-term impacts to soils and ground water quality as well as short-term impacts to surface water quality. Risk assessments prepared for the Forest Service on the designated herbicides indicate that some herbicides can affect the biological community in soils, potentially reducing its productivity (SERA 2003a, b; 2004 a, b; 2007b). Some herbicides dissolve readily in surface runoff and can flow to nearby streams, impacting surface water quality. Herbicides can also dissolve in infiltrating rainwater and impact groundwater, which could flow into streams and impact surface water. Herbicides applied with backpack sprayers can be transported by even low velocity winds to non-target soils and streams. Design features have been built into the proposed action to keep herbicides out of water and reduce the potential impacts from herbicides to an acceptable level.

Substances introduced into flowing streams are quickly diluted and transported downstream in turbulent stream flow, making effective water quality monitoring very difficult (Tchobanoglous 1987). Even small streams can quickly dilute small quantities of herbicides to low concentrations (SERA 2003a, b; 2004 a, b; 2007b). However, stable dissolved herbicides in eddies or pools could remain for weeks. As discussed earlier, keeping herbicides from reaching water through implementation of design features will further protect water quality.

The primary method of control of potential adverse effects from herbicide treatment is the use of design features and following manufacturer's directions on the labels. Direct hand application in comparison to broadcast spraying minimizes the amount of herbicide needed to treat invasive plant species. Design features that would reduce impacts to soil and water quality include developing a herbicide transportation, handling, and emergency spill response plan, having a spill kit on site when herbicide treatment methods occur, restrictions on herbicide and surfactant use near bodies of water and flowing streams, minimizing the chance of herbicides being introduced into the water, and limiting the amount of herbicide used to the minimum amount required to be effective. With these measures in place, the risk to water quality and soil is low. Forest Service Best Management Practices for use of herbicides will be strictly followed and have been built into the design features

Alternative 2, Proposed Action and Alternative 3, No Herbicides Specific to non Herbicide Activities

The non-herbicide treatments are analyzed together for both action alternatives since the effects are primarily limited to the physical impacts of personnel entry. These techniques include biological control agents, hand pulling, pulling using tools, clipping and cutting, girdling, tarping, and fire wilting.

Biological control agents are unlikely to have any direct effects on soils or water quality since there is no ground disturbance or rapid loss of vegetation. Indirectly they can improve the native plant component of the ecosystem over time and avoid the water and soil problems associated with invasive plants such as arundo and tamarisk.

Hand pulling, pulling using tools, clipping and cutting, girdling, tarping and fire wilting have similar impacts including ground disturbance due to foot traffic, dislodging sediments into streams, creation of foot trails, and creating areas of bare, disturbed ground. Hand treatments typically require multiple entries, possibly several per year, increasing the potential for these effects. Hand pulling and pulling using tools, would result in the greatest amount of soil disturbance compared to clipping and cutting, girdling, tarping, or fire wilting. Tarping, girdling, clipping and cutting, and fire wilting would likely result in the least soil disturbance. Fire wilting would be conducted when the ground is damp and should result in few effects from burning.

Tarping may reduce the number of soil microorganisms near the ground surface due to the heat generated by the tarp. This effect would be confined to the upper one or two inches of soil because

soil is a poor conductor of heat. The heated zone should re-colonize with microorganisms quickly from surrounding unaffected populations.

Areas of trampled or disturbed bare ground erode more readily than vegetated areas. Since most invasive species are relatively thin and scattered, it is anticipated that disturbed areas would be small and scattered so the overall adverse impacts to soils and water quality would be negligible to minor. The amount of soil disturbance generated by hand crews is negligible, very localized and short-term. Alternative 3 would have a greater impact on soil and water quality because the focus on treatment would be manual and mechanical treatment methods. This would likely require additional crews, more entries into the same area, and potentially more digging to remove root systems. Soil disturbance and potential erosion from alternative 3 would be minor increases over what is predicted for alternative 2. This could result in slight increases in turbidity in nearby streams. To decrease impacts to water quality, the following design feature would be used for either of the action alternatives: hand crews would stay out of flowing or ponded water whenever possible and if hand removal requires entry into flowing or ponded water, crews would keep the time in the water to a minimum. Overall adverse impacts from non-herbicide treatment activities would be negligible to minor, short-term, and localized to soil and water quality.

Cumulative Effects

Alternative 1, No Action
There are no cumulative effects because there are no activities proposed with this alternative.

Alternative 2, Proposed Action
The soil and water quality cumulative effects spatial boundary considered in this analysis is the fourth Hydrologic Unit Code (HUC) level Santa Clara River watershed. The effects would be scattered throughout the various fifth and sixth level subwatersheds that make up this watershed. The temporal boundary is 2005 to 2025, from five (5) years past to 15 years in the future. The previous five years are included to capture the effects of recent fires, various hazardous fuels treatments and fuelbreak management. The next 15 years includes the duration of the proposed project. Projects would occur throughout this time at unknown intervals and durations.

Based on the projects, activities, and recent fires within the cumulative effects spatial area, along with the potential effects from alternative 2, the cumulative impacts to soil and water quality would be negligible, localized, and short-term negative and long-term beneficial effects. Negative cumulative impacts to soils and water within the project area are primarily soil damage, erosion, and sediment transport to streams from the burned areas from the recent fires. These negative impacts would become reduced within the next few years as vegetation re-grows within the burned areas.

Alternative 3, No Herbicides
Though no herbicides are proposed with this alternative, the cumulative effects, including this alternative, would be similar to alternative 2: the cumulative impacts to soil and water quality would be negligible, localized, and short-term negative and long-term beneficial effects.

Wilderness

Affected Environment
The Magic Mountain Wilderness area is 12,282 acres and it is entirely within the project area. It is the smallest of the designated Wilderness Areas on the ANF. The area encompasses some extremely rugged terrain, especially steep, fractured slopes. Elevations range from 2,000 to 4,400 feet. The predominant vegetation is chaparral, with oak forest and woodlands in the canyons. There are no known major invasive problems in the wilderness at this time. However existing and potential

invasives plants threaten to degrade the natural character of the wilderness if left unchecked. There are some Spanish broom populations along the roads that surround the wilderness and they could be become a problem for the wilderness if left unchecked. The wilderness buffered from the roads by 300 feet so at the present time, the majority of the plants are outside of wilderness.

In 2000, the entire wilderness system on the Angeles National Forest had 100,000 visits, which accounted for less than 3 percent of total forest recreation use. Magic Mountain Wilderness is not heavily used at this time.

Environmental Consequences

Direct and Indirect Effects

Alternative 1, No Action Alternative

There would be no short-term direct or indirect effects to the wilderness from implementing the no action alternative. Over time, no action would increase populations of invasive plant species, including fire-adapted species (i.e., Spanish broom, tamarisk and arundo). In the short-term, the natural appearance would mostly be unnoticed. However, in the long-term, the spread of invasive plant species would adversely affect the natural appearance of wilderness by potentially out-competing native plant communities. This would be most evident near roads and trails on the edge of the wilderness and in riparian areas in the wilderness, where public use is the highest. Wildlife habitat and water resources would be negatively impacted. The opportunity for solitude or primitive and unconfined recreation would not be affected. Implementing this alternative would ultimately change ecosystems in a manner inconsistent with the 1964 Wilderness Act, Forest Plan, and the spirit and intent of wilderness areas where natural forces dominate change. This would result in adverse impacts in the Magic Mountain Wilderness and an incremental loss of natural character.

Alternative 2, Proposed Action

Wilderness

The proposed action, including herbicide treatment, is designed to protect the wilderness character of the Magic Mountain Wilderness. Invasive plants detract from the natural beauty and naturally functioning ecosystems that are supposed to be represented in wilderness. This alternative would have no effect on the undeveloped character of the wilderness. Treatment and restoration activities are intended to control or eradicate the high priority invasive plant species and control the moderate priority invasive plant species, thereby reducing or eliminating their effect on the wilderness. By removing or controlling high and moderate priority invasive plant species, the proposed action would allow native plant communities to function and evolve naturally.

Solitude is a component of wilderness character as defined in law (The Wilderness Act, 1964). Some visitors may believe their experience of solitude is degraded when work crews are seen on the trail or at treatment areas in the wilderness. These temporary adverse impacts would vary depending upon the treatment method. Design features are included to limit work crew presence during high use times (e.g. weekends, holidays) and to inform wilderness users about the purpose and need to manage invasive plants inside wilderness. While there are temporary effects in wilderness using all treatment methods, in the long-term wilderness character and experiences would be enhanced and are best protected with this alternative. Minimum Requirements or Minimum Tool Analysis will be approved prior to implementation of any project requiring herbicides or motorized equipment such as helicopters, chainsaws, and weed trimmers. Use of herbicides in the wilderness area will be approved when their use is necessary by the Regional Forester through a Pesticide Use Request.

Herbicide use, as with the other treatment methods, involves a temporary intrusion into the wilderness. Alone, or in combination with other methods, it requires no, or very little ground

disturbance, and individual plants can be treated in minutes (dependent on size) and, generally, with a much higher degree of effectiveness. Depending on the invasive plant species and size, repeat treatments in the wilderness with the use of herbicides are expected to be less than with totally non-herbicide methods due the effectiveness of herbicides as a tool[30]. Remote areas could require temporary overnight campsites which may include helicopter transport. With the lay of the land and the amount of access, this will occur rarely. This could include the transport of equipment such as tents, sanitary facilities, cooking equipment, tools and equipment to support temporary crews. The number and locations of suitable campsites have not been identified, and safe helicopter drop sites have not been located. These sites would be identified during the implementation phase and analyzed as part of the minimum tools analysis. With the use of herbicides, alternative 2 would require briefer stays and fewer trips into the wildernesses when compared with alternative 3. This is because the ability to use herbicides in combination with other treatment methods would require less time (e.g. physical activities of digging out the root systems versus cutting and spraying or daubing), and herbicides are generally more effective than solely using manual and mechanical treatment methods. Adverse impacts with these design features would be low.

The use of biological control agents is included in this alternative. A design feature requires that biological control agents will not be allowed if they are known to target the genus of any special status plant species is included. The species proposed for use at this time have been tested and evaluated by APHIS and California Department of Agriculture before release into California. Though this testing and evaluation reduces risks to the natural ecosystem, this treatment method does require the introduction of a non-native species into the project area, including potentially the wilderness. As noted in chapter 2, the Regional Forester must approve implementing this portion of the alternative in the wilderness area (FSM 2323.04c; USFS 2007).

There would be no effects to scientific, educational or historic uses in the wilderness. Conservation use would be protected by reducing the level of invasive plant interference with growth of native vegetation and degradation of habitat for native fish and wildlife species.

Alternative 3, No Herbicides

Wilderness

Alternative 3 has similar effects as alternative 2. As noted earlier, without the use of herbicides as a treatment option, treatments are likely to be less effective and would take longer to apply. Some invasive plants are difficult to eradicate and control without the use of herbicides, especially the larger and more mature plants. They would require frequent follow-up treatment, which is more difficult in wilderness areas where access can be difficult. It would be more difficult to eradicate and control the high priority invasive plants in the wilderness areas for these reasons. In addition, digging out root systems would require more ground disturbance, which would have some adverse effects on the wilderness characteristics.

This alternative would have no effect on the undeveloped character of the wilderness. No impacts would occur to the untrammeled nature of the wilderness under this alternative other than the likely continued presence of human-induced non- native plants and the potential temporary presence of helicopter transport. The natural character of the wilderness would be adversely affected by the expanding presence of invasive species. Despite efforts to control or eradicate invasive plants under

[30] Generalized summary based on FS and other local invasive species control expert experience with various high priority invasive perennial plants. (tamarisk, arundo, tree of heaven, Spanish broom).

this alternative, these plants are expected to effectively compete with native vegetative communities and diminish the natural character of the wilderness.

The outstanding opportunities for solitude or primitive and unconfined recreation would be negatively impacted by work crews for a short period of time at each entry. While design features are included to minimize these impacts (e.g. restrict project activities in wilderness areas during low-use periods, education/interpretation), the effectiveness of this alternative would likely require a continuous and indefinite presence of work crews for the foreseeable future. The number of repeated treatments needed to eradicate and control the high and moderate priority invasive plant species and to achieve success is unknown; thus, an aggressive and continuous eradication program would be required. Outstanding opportunities for solitude or primitive and unconfined recreation would be adversely affected for the short and long term. When compared with the proposed action, the work crew size and their continuing presence would interfere with these opportunities. Incorporating the design features to protect wilderness, adverse impacts would be reduced.

Cumulative Effects

The cumulative effects spatial boundary for the wilderness analysis is its physical boundary; temporal boundaries are the term of the project (15 years).

Alternative 1, No Action

Alternative 1 has no actions; therefore, there are no cumulative effects to wilderness.

Alternative 2, Proposed Action

Recreation use data and experience shows use levels in the Magic Mountain Wilderness are relatively low. The added crews to implement project activities in the wilderness would cumulatively affect this experience during the term of the project, but use would be planned outside of high visitor use periods to reduce this impact. Wildfire is a certainty in the Magic Mountain Wilderness since so much of it is chaparral. Should invasive plants invade into these burned areas following fire, this alternative would help reduce any potential adverse affects this could cause to the wilderness values.

Alternative 3, No Herbicides

Similar to alternative 2, the solitude and primitive experiences along trails would be cumulatively affected when combined with the wilderness users and the potential work crews during the term of this project. Alternative 3 would require more trips of longer duration than alternative 2; therefore, the impacts would be greater, but these added activities would not push the threshold of cumulative effects to solitude and primitive experiences to significance largely due to scheduling the work during lower use periods. Alternative 3 would not be as effective at reducing any potential expansion of invasives into the Magic Mountain Wilderness caused by wildfire but would likely still have positive impacts.

Recreation and Scenic Resource

Affected Environment

Recreation Users

The Santa Clara watershed is very diverse and the recreation use is also diverse.

Much of the recreational use is oriented to the water and in the riparian vegetation where temperatures are cooler. Hunting, fishing, hiking and OHV use are all popular uses of this area. Recreation use in a few riparian and streamside areas is highly concentrated in the form of family-based recreation. This concentrated use can lead to conflicts between user groups and with other resource values such as threatened, endangered, proposed, candidate and sensitive species. Ongoing

problems, such as trash and car dumping, graffiti, unauthorized OHV use, and maintaining closures exist and there is inadequate law enforcement coverage. While recreation use is often concentrated in the streams and riparian areas, use varies significantly throughout the project area. There are developed recreation sites scattered in the watershed as well as areas where there is heavy dispersed use such as Frenchman's Flat on Piru Creek. Campgrounds, picnic areas, trails and trailheads are often susceptible to invasive species. Driving for pleasure and nature observation are also activities which are popular. There is a substantial amount of authorized OHV use in portions of the watershed.

Scenic Resources

The project area serves two distinct landscapes. From the urban areas in the immediate and surrounding communities, large portions of the project area serve as a front country and back country backdrop as seen from stationary locations or from urban streets and highways. The cultural landscape is noticeably prominent and diverse. Its diversity is reflected in its vegetative mixes, its substantial elevation ranges, its prominent landforms and its stark contrast with the immediate urban development.

The second cultural landscape is viewed as visitors travel up slope from the Santa Clara River mainstem up the tributaries into the project area. Once visitors leave the urban area and away from the residential and commercial development, there is an immediate and profound change in the landscape character. While some of the same landscape features are present as seen from the urban area, these features are seen in a lot greater detail as the visitor travels up the canyons. The magnitude of the San Gabriel and Sierra Pelona Mountain Ranges becomes very evident, along with the rich diversity of ecosystems and plant communities. Steep to very steep slopes with sharp to rounded summits and narrow riparian canyons are the dominant landforms of this landscape.

The yearlong running water in Piru Creek , Bouquet Canyon and the other primary tributaries of the Santa Clara is the most noticeable key focal point and where most visitors would likely stop. Human influences are most apparent in developed and dispersed recreation areas and paths along the streams and roadways leaving the larger landscape to ecological change. Human impacts that create strong visual contrast in this landscape include, intensive use areas, graffiti, litter, utility corridors, reservoirs and dams, borrow sites, water retention basins, and road cuts.

The scenic integrity objectives (SIOs) are very high in the wilderness area, while the areas outside wilderness are high and moderate throughout the rest of the project area (Forest Plan; USFS 2005).

Environmental Consequences

Direct and Indirect Effects

Alternative 1, No Action Alternative

There would be no short-term direct or indirect effects to the scenic resources or to recreation use. Over time, implementing this alternative would allow increased populations of invasive plant species, including fire-adapted species (i.e., tamarisk, arundo). These invasive species could out-compete the native vegetation and could gradually change the ecosystems. Due to the typical density of the riparian invasive species (especially arundo), compared with native riparian vegetation, this would result in a gradual restriction of access along streams. It is unlikely the general public would notice a visual difference between native and non-native vegetation; therefore, there would likely be no short-term effect to the scenic resources. Over time, if the invasive plants are not controlled, there could be a loss of diversity of vegetation which could result in a degradation of scenic resources in the long-term.

Alternative 2, Proposed Action, Specific to Herbicide Treatment Methods

This section addresses direct and indirect effects to the recreation and scenic resources specific to the use of herbicides. Impacts from non-herbicide activities are addressed in the next section.

Recreation Users

The herbicide use in alternative 2, would cause minimal and temporary (short-term) displacements of forest visitors in treatment areas where there is concentrated or high public recreation use. Recreation users using vehicles along roads would not likely be affected as they travel through treatment areas. Trails that receive herbicide treatments would receive temporary closures, at a minimum, based on label requirements restricting access. Trail users in these areas would be adversely affected short-term. The design features that require avoiding high use periods, limiting temporary closures, and signage would reduce this impact. The stationary nature of water play, picnic, camping areas and areas of concentrated public use creates the most noticeable potential adverse impacts. To minimize impacts to these recreation users, several design features have been included with this alternative, including but not limited to: limiting activities to workdays and non-holidays, avoiding heavy recreation use periods; limiting the temporary closure of recreation areas and providing for appropriate signage and handouts; and providing interpretive information. The greatest short-term adverse impact to recreation users would likely occur in the high use areas and would have low to moderate short-term impacts. In all other areas within the project area, visitors may see treatments in progress; however, recreation use levels and patterns of use would not likely be affected by this alternative.

Scenic Resources

Herbicide treatment in all areas would have no effect on scenic resources except where numerous individual plants are spot sprayed in the same localized area of the immediate foreground. The visual effects of spot spraying within moist areas would remain brown temporarily (approximately one year) and would be replaced with native vegetation. On drier sites, the visual effects would be short-term (up to two to three years). Implementation of the design feature for considering restoration measures in areas greater than one acre that do not naturally rehabilitate would minimize or eliminate the potential visual effects of spot spraying. There would no visual effects from spot spraying within the middleground or background view areas. Localized spot spraying would meet the scenic integrity objectives within the project area as required in the Forest Plan. Application of herbicides would have no ground disturbance and the eventual browning of individual plants would duplicate the natural dying cycle of annual grasses and forbs which are widely spread throughout the project area. The design features would also ensure no adverse visual effects from the larger sized material by ensuring the treated material is located away from highly visible areas. As noted in alternative 1, the general public would not notice the difference between native and invasive plant species in the forest environment. In the long-term, the diversity of vegetation which is important visually would continue with the treatment of invasive plants.

Alternative 2, Proposed Action and Alternative 3, No Herbicides, Specific to non-Herbicide Activities

This section addresses direct and indirect effects to recreation users and scenic resources specific to non herbicide activities.

Should piles be burned by implementing either alternative, smoke would have a direct adverse effect to recreation users and the scenic resource. This would be short-term, and with the design feature that avoids activities during heavy recreation use periods, the design feature would reduce the impact to these two resources.

Recreation Users

Non-herbicide treatment methods and activities would have similar recreation user impacts as the herbicide treatment method. All adverse impacts (e.g. restricting access and use, noise) would be short-term and minor. These impacts would be reduced by implementing the design features for recreation. Besides those noted for herbicide treatment, an additional design feature, that would reduce impacts to recreation users, is to ensure that motorized equipment will be equipped with appropriate mufflers to minimize noise levels. The amount of disturbance from invasive treatment crews would be greater if herbicides are not used because of the increase in required follow-up treatments.

Scenic Resources

Several design features have been included to reduce the potential adverse impact to scenic resources from both action alternatives (i.e., piled material will be located away from highly visible areas and if this is not possible, the material will be disposed of at the earliest opportunity, large-sized lop and scattered material will be placed away from established trails and roads, and for those areas greater than one acre, if natural rehabilitation does not occur, more active restoration methods will occur [e.g. planting native vegetation]). Based on the implementation of these design features, individual non-herbicide activities would have minor or no adverse effect on the visual resource. In areas of concentrated or high public use, some visitors may notice the ground disturbance of manual or mechanical at the time of individual plant removal but the scenic impact to these users would be minor. As noted, the casual visitor would not notice the visual loss of the invasive plants nor the improved landscape character. More informed users appreciate the diversity of vegetation and recognize native and non-native stands of vegetation. In the long-term, treating invasive plants would help maintain vegetation diversity which is important visually.

Cumulative Effects

The cumulative effect spatial boundary is the Santa Clara watershed within and adjacent to the Forest, and the temporal boundary is the 15-year term for this project.

Alternative 1, No Action Alternative

There are no cumulative effects to recreation or scenic resources with the no action alternative.

Alternative 2, Proposed Action

Recreation Users

The cumulative effects to recreation users would be minor during the term of the project. The greatest impact to recreation users is likely from the closure orders caused by the recent wildfires on the Forest. Due to this action, increased recreation activities in the project area, along with the short-term closures due to treatment activities from this project, could have minor short-term adverse cumulative effects on the recreation experience.

Scenic Resources

Reviewing the cumulative activities that are occurring in this portion of the Forest, the greatest short-term impacts to the scenic resource is the recent fires. Though wildfire is a natural occurrence, burned areas do have negative scenic impacts. The scenic resource is already beginning to heal from the fires and will continue to recover over the next few years. The other activities (e.g. fuelbreak and other fuels reduction activities) are minor in scope to the visual landscape. There are several powerlines and other utility corridors which adversely impact scenic resources and alternative 2 has little effect to add to the cumulative effect to the scenic resource. Cumulative short-term adverse effects are

moderate, mainly due to wildfire and transportation/utility corridors. There would be no cumulative, long-term, adverse effects.

Alternative 3, No Herbicides

Cumulative effects to recreation users and the scenic resource are the same as alternative 2. There may be some additional cumulative impacts to recreation users under this alternative because not using herbicides would result in increased amount of crew and equipment time treating and retreating invasive plants. However, manual methods would not require closure of the recreation site temporarily as with herbicide treatment.

Consequences Relative to Significance

Council on Environmental Quality regulations (40 CFR part 1500-1508) for implementing the National Environmental Policy Act (NEPA) includes a definition of "significance." The elements of this definition are important for a finding of no significant impact. The elements of significance are discussed below in relation to all action alternatives. Specialist reports and required documents needed for the environmental assessment analysis and compliance with law, regulation, or policy are located in the project file. Conclusions from these reports are discussed and referenced below. These reports are incorporated by reference.

Context

Context means that the significance of an action must be analyzed in several contexts (i.e., local, regional, worldwide) and over short and long timeframes. For site-specific actions, significance usually depends upon the effects in the locale rather than in the world as a whole (40 CFR 1508.27(a)). Both short-term and long-term effects are relevant.

This project is located in the northern portion of the Angeles National Forest. This Forest is an urban forest with large population centers nearby (e.g. Los Angeles and Santa Clarita). Though this project covers roughly 253,000 acres, the entire project area would not be treated by either action alternative since the density of invasive plants in the project area at this time are scattered, in small pockets, or individuals. Both action alternatives would not have a significant affect to society locally or regionally, neither short-term nor long-term.

Intensity

Intensity refers to the severity of expected project impacts. The following ten factors and their expected impacts are considered below.

Beneficial and Adverse Impacts

Both beneficial and adverse effects have been taken into consideration and displayed in this chapter. Beneficial effects have not been used to offset or compensate for potential adverse effects. Singularly and collectively, the resources affected by the action alternatives are not likely to be exposed to significant impacts.

The potential adverse impacts associated with the action alternatives include:

- Human health and safety risks from the use of herbicides/adjuvants are negligible for aminopyralid; low for chlorsulfuron, glyphosate, imazapyr, adjuvants (in general); and moderate for triclopyr. Human safety risks from non-herbicide activities for workers are low for workers/crew members and negligible for the general public.
- Alternative 3 would be less effective in achieving the project purposes for some high and all moderate and low priority invasive plant species trend or growth (in terms of number of species and size of area).

- Short-term adverse impacts to water quality and soil from the use of herbicides for alternative 2 are negligible (no application or drift allowed in water); for alternative 3 adverse impacts to water quality and soil are negligible.
- Short-term adverse impacts from alternatives 2 and 3 to wilderness experiences would be low.
- Wildlife disturbance resulting from crews and work activities.

Beneficial impacts include:

- Both action alternatives treat tamarisk and arundo (fire-adapted invasive plants) reducing the risk of higher severity fires and shorter return intervals than what is typical in riparian habitat.
- Alternative 2 would have an overall trend of decreasing invasive plant growth (in terms of number of species and size of area); alternative 3 would have an overall trend of controlling or containing only the high priority species in some areas.
- Both action alternatives allow for early detection and rapid response to newly found invasive plants within the project area; therefore, providing higher success in eradicating or controlling the species.
- Long-term, alternative 2 would have a beneficial impact to special status plant and wildlife species by eradicating existing infestations and keeping invasive plants out of their habitat or controlling invasive spread. Alternative 3 would be successful in preventing the expansion and possibly decrease the area of high priority invasive plants; therefore, having long-term beneficial effects to those species where the high-priority species typically grow.
- There would be long-term beneficial impacts to wilderness experiences and wilderness character for alternative 2 and to a lesser degree with alternative 3 (where moderate and low priority species would likely continue to expand).
- By retaining diversity of vegetation (versus more of a monoculture of invasive plants), alternative 2, and to a lesser extent alternative 3, would have a beneficial effect on the scenic resources.
- Treatment of invasives on the National Forest will benefit downstream landowners and water users by eliminating the seed and plant parts that invade downslope.

The Degree of Effect to Public Health and Safety

As noted in the human health and safety section in this chapter, health and safety was broken into three main groups: fire and fuels; non-herbicide activities; and herbicide use. Both alternatives include design features to reduce potential human health and safety risks to below the level of concern. The highest potential human health risk is from the use of triclopyr around women of childbearing age for alternative 2. An extra precaution is included in the design features specific to triclopyr to reduce these risks (e.g. requiring triclopyr use only if the other approved herbicides are not effective in treating a specific invasive plant species). In addition, with the other herbicide design features (e.g. implementing an herbicide transportation, handling and emergency spill response plan and safety plan [including the need for personal protective equipment/clothing]; cutting vegetation that can be consumed by humans prior to herbicide treatment; signing and temporary closing areas based on label directions), the use of triclopyr is below the level of concern.

Unique Characteristics of the Geographic Area, including Historic and Cultural Sites

Unique characteristics for this project are defined as: proximity to historical or cultural sites, wilderness areas, designated and eligible wild and scenic rivers, and critical biological land use zones.

There are eight design features that are incorporated in both action alternatives to reduce potential adverse effects to historic or cultural sites (e.g. pre-treatment surveys; when unanticipated sites are

found (that could be adversely affected) all work will stop and will not proceed in the area without approval from the Forest Heritage Program Manager; sites that could be potentially impacted by the project activities will be flagged and avoided). Based on these measures, no direct or indirect effects are anticipated to historical or cultural sites. In addition, a design feature to protect known sensitive traditional tribal use areas will minimize impacts to cultural sites.

Wilderness areas are addressed in this Chapter. Based on the analysis, no significant impacts are expected to occur in the Magic Mountain Wilderness. Controlling invasive weeds will protect the Wilderness character with only short-term loss of solitude during treatment. Design features have been included to reduce the impact on solitude by doing the work during the week and not on weekends.

The project area has designated (Piru Creek) and eligible (San Francisquito Creek) Wild and Scenic Rivers.. The outstanding remarkable values at these two sites are geology and historical values respectively. Both action alternatives would not have adverse effects on the classification of these river segments. Long-term effects would be beneficial by retaining the natural ecosystem in these areas (alternative 2 would be more effective than alternative 3).

This project includes the Soledad Canyon critical biological zone (CBZ classified under the Forest Plan). The primary species to protect are the unarmored threespine stickleback and arroyo toad, both endangered species under the Endangered Species Act. San Francisquito Canyon CBZ has known populations of California red-legged frog, unarmored threespine stickleback, and arroyo toad. The Castaic CBZ also has a population of arroyo toad. The greatest risk in these critical biological zones from the proposed project is from the use of herbicides with alternative 2. The use of herbicides is also very important in maintaining the natural diversity in these areas. Design features have been included to minimize impacts to the aquatic species (e.g. no herbicide applications can occur in occupied or critical habitat during the breeding and spawning season; if aquatic registered glyphosate or triclopyr is applied near surface water in these areas, the rate cannot exceed 3 pounds a.e. per acre. In addition, only the aquatically labeled formulations of glyphosate, imazapyr and triclopyr and low-risk aquatically approved surfactants will be allowed within 100 feet of the banks of rivers and tributaries (triclopyr BEE has an added restrictive buffer of 150 feet in special status fish and amphibian occupied habitat and is not allowed for use in the floodplain of any intermittent or perennial stream).. Based on the action alternatives descriptions, including design features, adverse effects are expected to be below the level of significance. Controlling and containing invasive plants in the critical biological zones would help maintain the unique values that resulted in the area being designated. .

The Degree to which the Effects on the Human Environment are likely to be Highly Controversial

The project was listed in the Schedule of Proposed Actions (SOPA) on the Angeles National Forest internet webpage beginning on April 1, 2010 and every quarter since. Scoping and public notification were conducted to inform the public of the proposal and provide them an opportunity to raise any issues associated with this invasive plant treatment proposal. A scoping letter was mailed out to approximately 370 agencies, groups, and individuals on August 18, 2010, which included a summarized description of the proposed action. A legal notice informing the public of this project proposal (with a 30-day scoping period) was published August 18, 2010, in the *LA Daily News*. The detailed purpose and need and proposed action document, map, and scoping letter were included on the Forest websites under "Projects and Plans" starting August 18, 2010. (http://www.fs.fed.us/r5/angeles/projects/). This internet site was referred to in both the legal notice and scoping letter.

Additional requests for input were sent to Native American groups and individuals. On September 21, 2010, the Forest Supervisor sent letters to two potentially affected tribes. A letter was also sent to 121 individuals and groups on the Forest list for the Native American community potentially interested in vegetation management projects.

Fourteen comment letters or e-mail messages were received with one opposing the use of herbicides. Based on the level of outreach and the response, it is unlikely the effects to the human environment from this project would be highly controversial. Activities were designed to minimize or eliminate potential effects on the human and natural environment.

The Degree to which the Possible Effects on the Human Environment are Highly Uncertain or Involve Unknown Risks

Herbicide effects were mainly determined by the SERA risk assessments in which SERA collected various studies and data to come to their conclusions. They included studies that were not part of US EPA's review of the herbicides when they were available. Typically, studies on human health from the use of herbicides are not conducted on humans. Assumptions are made and interpolated from various animal species studies. Because all five herbicides have been approved by US EPA and are certified for use by the State, it is unlikely the risks are highly uncertain or involve significant unknown risk. In addition, numerous design features have been incorporated into alternative 2 to reduce potential risks to the environment caused by the use of herbicides (e.g. reduce risks for spill, reduce the potential for drift, implement safety plans [including the need for personal protective equipment], allowing only aminiopyralid, chlorsulfuron and the aquatically labeled formulations of glyphosate, imazapyr, and triclopyr, and low-risk aquatically approved surfactants within 100 feet of the banks of rivers and streams, complying with federal, state, and local laws including complying with label instructions).

The Degree to which the Action may Establish a Precedent for Future Actions with Significant Effects or Represents a Decision in Principle about a Future Consideration

The action alternatives are project-specific and do not establish a precedent for future actions with significant effects. Any future actions not covered by this proposal would need to consider all relevant scientific, site-specific information available at that time, and an independent environmental analysis of environmental consequences. The project does not involve future connected actions.

Whether the Action is related to other Actions with Individually Insignificant but Cumulatively Significant Impacts

Based on the cumulative effects analysis addressed for each resource in this chapter, there would be no significant cumulative effects. The analysis determined both action alternatives, when combined with other actions in the project area, would likely have beneficial cumulative effects related to reducing the spread of invasive plant species by either expanding the capacity of the other actions for control and eradication efforts or by mitigating their potential for increasing invasive plant distribution and abundance in the project area (alternative 3 having less beneficial effect).

The Degree to which the Action May Adversely Affect Districts, Sites, Highways, Structures, or Objects Listed in or Eligible for Listing in the National Register of Historic Places, or may cause Loss or Destruction of Significant Scientific, Cultural, or Historic Resources

As noted in the third intensity factor above, the action alternatives, including the implementation of the heritage resource design features, are not expected to have direct or indirect adverse effects to cultural resource sites. By implementing the design features, which include pre-treatment surveying in areas and projects with potential effects, flag and avoidance, and monitoring protection measures

effectiveness, both action alternatives would have a less than significant effect to cultural and historic resources.

The Degree to Which the Action may Adversely Affect an Endangered or Threatened Species or its Habitat that has been Determined to be Critical under the Endangered Species Act of 1973

The project has potential habitat for one threatened species: California red-legged frog and five endangered species: Nevin's barberry (*Berberis nevinii*), southwestern willow flycatcher (*Empidonax traillii extimus*), least Bell's vireo, arroyo toad, and unarmored threespine stickleback. Critical habitat for California red-legged frog and arroyo toad is also present. There are many design features to minimize impact to federally listed plant and wildlife species (e.g. pre-treatment surveys; restriction on herbicide use near known populations; possibly flag and avoid, seasonal restrictions; monitor where treatments occur near listed plant populations). Based on the analysis in this chapter, the impacts from both action alternatives would be below the level of significance.

Whether the Action Threatens a Violation of Federal, State, or Local Law or Other Requirements Imposed for the Protection of the Environment

The action alternatives are in compliance with federal, state, and local laws and other requirements imposed for the protection of the environment. Based on the project design (chapter 2 of the EA) and effects analysis (summarized in this chapter and detailed in the various specialist reports), the action alternatives are in compliance with the National Environmental Policy Act, ESA, Clean Water Act, and National Forest Management Act (including compliance with the Land Management Plan).

Management Indicator Species – Placeholder for info Pete will be putting in the EA.

In accordance with guidance from the Regional Forester of the Pacific Southwest Region, U.S. Forest Service, issued March 1, 2011, the project does not need to obtain permits under the National Pollutant Discharge Elimination System (NPDES) of the Clean Water Act. Since the project involves no construction and only minimal ground disturbance, other permitting requirements of the Clean Water Act such as sections 401 or 404 are not applicable. The project will improve condition and function of wetlands, and is in full compliance with the Clean Water Act.

Several natural and social resources were not discussed in detail in this document because they were not addressed as a concern or issue from the public or the interdisciplinary team during scoping. Below are some of these applicable federal, state, and local laws and regulations with a brief compliance summary.

Based on the air quality specialist report, the action alternatives are also in compliance with California Code of Regulations, Title 17, Smoke Management Guidelines for Agricultural and Prescribed Burning, California Air Resources Board and South Coast Air Quality Management District regulations. Estimates of emissions produced from this project were calculated and they stay below the threshold of significance established by the air district; three air quality design features are included in both action alternatives. These design features would reduce the level of emissions either alternative could produce. By not exceeding the level of significance, the action alternatives would not impede the progress of the air district towards attainment of the National Ambient Air Quality Standards; therefore, they are compliant with the Clean Air Act.

As noted earlier, there would be minimal effect to heritage resource sites. By including protection measures in the outlined in the Programmatic Agreement Among the USFS Forest Service Region 5, Pacific Southwest Region, the California State Historic Preservation Officer, and Advisory Council on Historic Preservation Regarding the Process for Compliance with Section 106 of the National Historic Preservation Act for Undertakings on the National Forests of the Pacific Southwest Region

(Adopted February 2013), both action alternatives are in compliance with the National Historic Preservation Act.

The action alternatives are in compliance with Executive Order 13186 (migratory birds). The action alternatives have a design feature that requires avoiding treatment activities during bird breeding season whenever practicable. If work is performed during the breeding season, applicators and other project personnel will watch for nests and disturbed nesting birds. If active nests are located, any work should be completed quickly near the nest to reduce disturbance. Some short-term adverse effects may occur, but in the long-term there would be substantial benefits to migratory birds and their habitat by removing invasive plants. Short-term disturbance can generally be tolerated by nesting birds.

Executive Order 12898 relating to Environmental Justice requires an assessment of whether minorities or low-income populations would be disproportionately affected by any proposed action. In no case was the treatment prescription design based on the demographic makeup, public recreation use, occupancy, property value, income level or any other criteria reflecting the status of adjacent non-federal land or within nearby communities. Federally owned lands proposed for treatment are widely distributed throughout the project area and are intermixed with some non-federal lands. Reviewing the location of the proposed treatments in any of the alternatives in relationship to non-federal land, there is no evidence to suggest that any minority or low income neighborhood or recreation use patterns would be affected disproportionately. Conversely, there is no evidence that any individual, group or portion of the community would benefit unequally from any of the actions in the proposed alternatives.

For alternative 2, only Federal and State approved herbicide and adjuvants would be used and treatment would comply with federal, state, and local law. The action alternatives are not in conflict with planning objectives for Los Angeles County.

CHAPTER 4 – LIST OF AGENCIES AND PERSONS CONSULTED

The Forest Service consulted the following individuals, federal, state, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

INTERDISCIPLINARY (ID) TEAM MEMBERS:

Steve Loe, Consulting Biologist
Tasha Hernandez, Resource Officer, Santa Clara-Mojave River Ranger District
Janet Nickerman, Botanist, Angeles National Forest
Diane McCombs, Recreation Staff Officer, Santa Clara-Mojave River Ranger District
Karen Bauman, Fuels Specialist, Santa Clara-Mojave River Ranger District

FEDERAL, STATE, AND LOCAL AGENCIES:

US Fish and Wildlife Service is being consulted with on this project. In addition, many agencies were contacted during scoping; including, US Army Corp of Engineers, California Fish and Game, CA Dept. of Water Resources and CALFIRE, County of Los Angeles (including the Department of Public Works, Water Resources), Cities of Santa Clarita, Agua Dulce, Lancaster, and Palmdale. Numerous local water agencies and the LA Regional Water Quality Control Board were contacted during scoping.

NATIVE AMERICAN TRIBES:

As noted in Chapter 1, Native Americans were contacted a variety of ways during scoping; including, being sent the scoping letter, emailing Native American traditionalists and mailing specific letters to potentially interested groups requesting the identification of specific areas still being used by Tribal members for plant harvesting or collecting and asking for any concerns related to the project. The Forest biologists also gave a presentation at a Forest Native American Partner meeting December 16, 2010 on various invasive plant treatment projects on the Forest, including this project.

OTHERS:

David Bakke, Pacific Southwest Region Pesticide Specialist and Invasive Plants Program Manager
Tasha Hernandez, Resource Officer, Santa Clara/Mojave Rivers Ranger District, Angeles National Forest
Shawna Bautista, Region 6, Invasive Species Program Lead.
Marian Kadota, ID Team Leader for San Gabriel Invasive Project, AMSET
Esmeralda Bracamonte, Resource Officer, San Gabriel Ranger District
Mike McCorison, Air Resource Specialist, and former Hydrologist, Angeles National Forest
Debra Nelson, Botanist and Certified Pesticide Applicator, San Bernardino National Forest
Paul Gregory, Hydrologist, Angeles National Forest
Teresa Sue, Wildlife Biologist, AMSET
Pete Johnston, Wildlife Biologist, Santa Clara/Mojave Rivers Ranger District, Angeles National Forest
Della_Snyder-Velto, US Fish and Wildlife Service, Ventura, CA.
Jesse Bennett, US Fish and Wildlife Service, Carlsbad, CA.

REFERENCES

Asher, JE and SA Dewey. 2005. *Unpublished Document.* White paper titled, "Estimated Annual Rates of Weed Spread on Western Federal Lands".

Auletta, C. 1988. A Chronic Dietary Toxicity and Oncogenicity Study with AC 243,997 in Mice: Report No. 86-3074. Unpublished study prepared by Bio/dynamics Inc. 2795 p. MRID No. 41039504 as referenced in Syracuse Environmental Research Associates (SERA). 2004b. Imazapyr - Human Health and Ecological Risk Assessment Final Report. Syracuse Environmental Research Associates. SERA TR 04-43-17-05b. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/121804_Imazapyr.pdf on January 15, 2010.

Bakke, David. 2003. *Unpublished Document*. Human and Ecological Risk Assessment of Nonylphenol Polyethoxylate-based (NPE) Surfactants in Forest Service Herbicide Applications. USDA Forest Service, Pacific Southwest Region, Vallejo, CA. Accessed on the World Wide Web at http://www.fs.fed.us/r6/invasiveplant-eis/Risk-Assessments/NPE-Surfactant_RA_final.pdf on January 14, 2010.

Bakke, David. 2007. *Unpublished Document.* Analysis of issues surrounding the use of spray adjuvants with herbicides. USDA Forest Service, Pacific Southwest Region, Vallejo, CA. Accessed on the World Wide Web at http://www.fs.fed.us/r5/spf/fhp/pesticide/surfactants_Jan_07_update.pdf on January 14, 2010.

Beyers, Jan. 2010. Plant Ecologist, USDA Forest Service, Pacific Southwest Research Station, Forest Fire Laboratory. 4955 Canyon Crest Drive, Riverside, CA 92507. Personal communication with Wendy Boes.

Brooks, Matthew, 2008. General Technical Report, RMRS-GTR-42, Volume 6, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Brooks, Matthew L., Carla M. D'antonio, David M. Richardson, James B. Grace, Jon E. Keeley, Joseph M. Ditomaso, Richard J. Hobbs, Mike Pellant, And David Pyke. 2004. Effects of Invasive Alien Plants on Fire Regimes. BioScience. 54(7):667-688. Accessed on the World Wide Web at http://www.fws.gov/fire/downloads/Effects%20of%20Invasive%20Alien%20Plants%20on%20Fire%20Regimes.pdf on June 10, 2010.

Brooks, M.L. and R.A. Minnich. 2006. Southeastern deserts bioregion. In: Sugihara, N.G., van Wagtendonk, J., Shaffer, K.E., Fites-Kaufman, J., Thode, A.E. (Eds.), Fire in California's Ecosystems. University of California Press, Berkeley, California, pp. 391–441.

California Invasive Plant Council. Assessed on the World Wide Web at http://www.cal-ipc.org/about/index.php on June 10, 2010.

California Invasive Plant Council California Invasive Plant Council California Invasive Plant Council California Invasive Plant Council. 2003. Symposium Presentations: Planning Weed Management for Ecosystem Recovery. Accessed on the World Wide Web at http://www.cal-ipc.org/symposia/archive/2003_presentations.php on June 10, 2010.

Carpenter A.T. 1998. Element Stewardship Abstract for *Tamarix ramosissima Ledebour, Tamarix pentandra Pallas, Tamarix chinensis Loureiro, Tamarix parviflora De Candolle*, Saltcedar, Salt cedar, & Tamarisk. Edited by Ramona A. Robison and John M. Randall, The Nature Conservancy, Wildland Weeds Management and Research, 124 Robbins Hall, University of California, Davis, CA 95616.

Colorado Natural Areas Program, et al. 2000. Creating an Integrated Weed Management Plan, A Handbook for Owners and Managers of Lands with Natural Values. Caring for the Land Series, Volume IV. Accessed on the World Wide Web at http://parks.state.co.us/NaturalResources/CNAP/Publications/Pages/CNAP%20publications.aspx on June 10, 2010.

Daly I. 1988. A Chronic Dietary Toxicity and Oncogenicity Study with AC 243,997 in Rats: Report No. 84-2862. Unpublished study prepared by Bio/dynamics Inc. 3597 p. MRID No. 41039503 as referenced in Syracuse Environmental Research Associates (SERA). 2004b. Imazapyr - Human Health and Ecological Risk Assessment Final Report. Syracuse Environmental Research Associates. SERA TR 04-43-17-05b. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/121804_Imazapyr.pdf on January 15, 2010.

Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW). 2004. Issue Paper on Invasive Plant Management Using Integrated Pest Management. Accessed on the World Wide Web at http://www.fs.fed.us/ficmnew/documents/guidance/FICMNEW_Issue_Paper_Invasive_Plant_Management_090104.pdf on June 10, 2010.

Hardell L; Eriksson M. 1999a. A Case-Control Study of Non-Hodgkin Lymphoma and Exposure to Pesticides.. Cancer 85(6):1353-1360 as referenced in Syracuse Environmental Research

Associates (SERA). 2003a. Glyphosate -Human Health and Ecological Risk Assessment Final Report. Syracuse Environmental Research Associates. SERA TR 02-43-09-04a. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/04a03_glyphosate.pdf on January 15 2010.

Hoshovsky, M. 1986. *Spartium junceum* (Spanish broom). The Nature Conservancy - Element Stewardship Abstract. The Nature Conservancy. Arlington, VA. Pp.17.

Hoshovsk, Marc C.; Randall, John M. 2000. Invasive plants of California's wildland, management of invasive species [online article] available at www.cal-ipc.org/ip/management/ipcw/mois.php, accessed 2/17/2010.

Marin Municipal Water District Vegetation Management Plan, Herbicide Risk Assessment (draft). 2008. Draft Assessment completed by Pesticide Research Institute, Berkeley, CA. Accessed via World Wide Web at http://marinwater.org/controller?action=menuclick&id=437 on January 14, 2010.

Masters, R. A., and R. L. Sheley. 2001. Principals and practices for managing rangeland invasive plants. Journal of Range Management 54:502-517.

Muzika, Rose-Marie and Jil M. Swearingen. May 20, 2005. Fact Sheet: Saltcedar. Plant Conservation Alliance's Alien Plant Working Group. Accessed on the World Wide Web at http://www.nps.gov/plants/ALIEN/fact/tama1.htm

The National Fire Plan. 2006. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Strategy Implementation Plan. Accessed on the World Wide Web at http://www.forestsandrangelands.gov/plan/documents/10-YearStrategyFinal_Dec2006.pdf on January 15, 2010.

Pannill, Phil. 2000 (originally prepared in 1995). Forest Service Information: Tree-of-Heaven Control. Maryland Department of Natural Resources, Hagerstown, MD. Accessed on the World Wide Web at http://www.naturalresources.umd.edu/Publications/PDFs/Other/TreeOfHeaven.pdf on June 10, 2010.

Pierson, E.D, Rainey W.E. and Corben, C. 2006. Distribution and Status of Western Red Bats (*Lasiurus blossevillii*) in California. Prepared for the Species and Recovery Program, Habitat Conservation Planning Branch, California Department of Fish and Game. Sacramento, CA. 45pp.Simberloff, D. and P. Stiling 1996. How risky is biological control? Ecology 77(7): 1965-1974.

Pitcairn, Mike. 2012. Personal Communication regarding biological control of yellow star thistle. California Department of Food and Agriculture. Senior Environmental Scientist.

Syracuse Environmental Research Associates (SERA). 2003a. Glyphosate -Human Health and Ecological Risk Assessment Final Report. Syracuse Environmental Research Associates. SERA TR 02-43-09-04a. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/04a03_glyphosate.pdf on January 15 2010.

Syracuse Environmental Research Associates (SERA). 2003b. Triclopyr -Revised Human Health and Ecological Risk Assessments Final Report. Syracuse Environmental Research Associates. SERA TR 02-43-13-03b. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/0303_triclopyr.pdf on January 15 2010.

Syracuse Environmental Research Associates (SERA). 2004a. Chlorsulfuron - Human Health and Ecological Risk Assessment Final Report. Syracuse Environmental Research Associates. SERA TR 04-43-18-01c. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/112104_chlorsulf.pdf on January 15 2010.

Syracuse Environmental Research Associates (SERA). 2004b. Imazapyr - Human Health and Ecological Risk Assessment Final Report. Syracuse Environmental Research Associates. SERA TR 04-43-17-05b. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/121804_Imazapyr.pdf on January 15, 2010.

Syracuse Environmental Research Associates (SERA). 2004c. Sulfometuron Methyl - Human Health and Ecological Risk Assessment Final Report. Syracuse Environmental Research Associates. SERA TR 03-43-17-02c. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/121404_Sulfometuron.pdf on January 15 2010.

Syracuse Environmental Research Associates (SERA). 2005. Hexazinone - Human Health and Ecological Risk Assessment Final Report. Syracuse Environmental Research Associates. SERA TR 05-43-20-03d. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/102505_hexazinone_ra.pdf on January 15 2010.

Syracuse Environmental Research Associates (SERA). 2007a. Preparation of Environmental Documentation and Risk Assessments for the USDA/Forest Service. Syracuse Environmental Research Associates. SERA MD 2007-01a. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/PrepEnvirmentalDoc_01-07.pdf on January 15 2010

Syracuse Environmental Research Associates (SERA). 2007b. Aminopyralid - Human Health and Ecological Risk Assessment Final Report. Syracuse Environmental Research Associates. SERA TR -052-04-04a. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/062807_Aminopyralid.pdf on January 15 2010.

Tchobanoglous, George and E. D. Schroeder. 1987. Water Quality. Addison-Wesley Publishing Company, Inc. 768 pp.

Tu, M., C. Hurd, and J.M. Randall (2001). Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas (Version date: April 2001). The Nature Conservancy.

United States Environmental Protection Agency. 2006. Section 303(d) List Fact Sheet for Watershed San Gabriel. Accessed online at: http://oaspub.epa.gov/tmdl/huc_rept.control?p_huc=18070106&p_huc_desc=SAN%20GABRIEL&p_cycle=2006. Accessed March 10, 2010.

United States Fish and Wildlife Service, 2008. Managing invasive plants: concepts, principles, and practices. Accessed online at: http://www.fws.gov/invasives/StaffTrainingModule/methods/biological/review.html

United States Forest Service. 1985. Forest Service Handb. 6709.12, Chapter 10. Safety and Health Program Administration. Washington, DC. Accessed on the World Wide Web at http://www.fs.fed.us/cgi-in/Directives/get_dirs/fsh?6709.12!.. On January 20, 2010.

United States Forest Service. 1994a. Forest Service Handb. 2109.14. Pesticide-Use Management and Coordination Handbook. Washington, DC. Accessed on the World Wide Web at http://www.fs.fed.us/cgi-bin/Directives/get_dirs/fsh?2109.14!.. On January 20, 2010

United States Forest Service. 1994b. Forest Service Manual. 2150. WO Amendment 2100-94-7. Pesticide-Use Management and Coordination. Washington, DC. Accessed on the World Wide Web at http://www.fs.fed.us/im/directives/fsm/2100/2150.txt on January 20 2010.

United States Forest Service. 1994c. First Amended Regional Programmatic Agreement Among the USDA Forest Service Region 5, Pacific Southwest Region, the California State Historic Preservation Officer, and Advisory Council on Historic Preservation Regarding the Process for Compliance with Section 106 of the National Historic Preservation Act for Undertakings on the National Forests of the Pacific Southwest Region.

United States Forest Service. 1999. Forest Service Handb. 6709.11, Chapters 50, 60, 70. Health and Safety Code Handbook. Washington, DC. Accessed on World Wide Web at http://www.fs.fed.us/im/directives/fsh/6709.11/FSH6709.pdf on January 20 2010.

United States Forest Service. 2005. Angeles National Forest Land Management Plan. U.S. Forest Service, Department of Agriculture. Pacific Southwest Region.

United States Forest Service. 2007a. Forest Service National Strategic Plan FY 2007-2012. FS-880. Washington DC. Accessed on the World Wide Web at http://www.fs.fed.us/publications/strategic/fs-sp-fy07-12.pdf on January 14, 2010.

United States Forest Service. 2007b. Forest Service Manual. 2320 Wilderness Management. Washington, DC. Accessed on the World Wide Web at http://www.fs.fed.us/cgi-bin/Directives/get_dirs/fsm?2300!.. On June 10, 2010.

United States Forest Service. 2008. Comparison of relocatable commercial vehicle washing systems. San Dimas, CA. Accessed on the World Wide Web at http://www.weedcenter.org/management/docs/09_VehicleWashingSystemReport.pdf on August 30, 2010.

United States Forest Service. 2010a. *Unpublished Document.* Aminopyralid: Forest Service Risk Assessment Program Worksheets for the SGRRD Invasive Plant Treatment Project. ANF, Region 5, Pacific Southwest Region.

United States Forest Service. 2010b. *Unpublished Document*. Chlorsulfuron: Forest Service Risk Assessment Program Worksheets for the SGRRD Invasive Plant Treatment Project. ANF, Region 5, Pacific Southwest Region.

United States Forest Service. 2010c. *Unpublished Document.* Glyphosate: Forest Service Risk Assessment Program Worksheets for the SGRRD Invasive Plant Treatment Project. ANF, Region 5, Pacific Southwest Region.

United States Forest Service. 2010d. *Unpublished Document*. Imazapyr: Forest Service Risk Assessment Program Worksheets for the SGRRD Invasive Plant Treatment Project. ANF, Region 5, Pacific Southwest Region.

United States Forest Service. 2010e. *Unpublished Document.* Triclopyr BEE (3 lbs/ac): Forest Service Risk Assessment Program Worksheets for the SGRRD Invasive Plant Treatment Project. ANF, Region 5, Pacific Southwest Region.

United States Forest Service. 2010f. *Unpublished Document*. Triclopyr TEA (3 lbs/ac): Forest Service Risk Assessment Program Worksheets for the SGRRD Invasive Plant Treatment Project. ANF, Region 5, Pacific Southwest Region.

United States Forest Service. 2011. San Gabriel River Invasive Plant Treatment Project. Project File on San Gabriel Ranger District. San Gabriel River Ranger District, 110 N. Wabash Avenue Glendora, CA 91741

United States Forest Service. 2011. FS Manual 2900 Invasive Species Management. Current as of July 12, 2012. http://www.fs.fed.us/im/directives/dughtml/serv_fsm.html

United States Forest Service. 2012. Forest Service Invasive Species Website. Current as of July 12, 2012. http://www.fs.fed.us/invasivespecies/

United States Forest Service. 2012. Region 6 Invasive Plant Toolbox. Current as of July 12, 2012. http://www.fs.fed.us/r6/invasiveplant-eis/Region-6-Inv-Plant-Toolbox/ .

United States Office of Prevention, Pesticides Environmental Protection and Toxic Substances Agency (OPP-EPA). 1993. R.E.D. Pesticide Fact Sheet: Glyphosate. Accessed via World Wild Wet at http://www.epa.gov/oppsrrd1/REDs/factsheets/0178fact.pdf on January 14 2010.

United States Office of Prevention, Pesticides Environmental Protection and Toxic Substances Agency (OPP-EPA). 1998. R.E.D. Pesticide Fact Sheet: Triclopyr. Accessed via World Wild Wet at http://www.epa.gov/oppsrrd1/REDs/2710red.pdf on January 21 2010.

United States Office of Prevention, Pesticides Environmental Protection and Toxic Substances Agency. 2002. Glyphosate: Pesticide Tolerances, 40 CFR Part 180. Federal Register. 67(188): 60934-60950 as referenced in Syracuse Environmental Research Associates (SERA). 2003a. Glyphosate -Human Health and Ecological Risk Assessment Final Report. Syracuse Environmental Research Associates. SERA TR 02-43-09-04a. Accessed on the World Wide Web at http://www.fs.fed.us/foresthealth/pesticide/pdfs/04a03_glyphosate.pdf on January 15 2010.

United States Office of Prevention, Pesticides Environmental Protection and Toxic Substances Agency (OPP-EPA). 2005a. R.E.D. Pesticide Fact Sheet: Aminopyralid. Accessed via World Wide Web at http://www.epa.gov/opprd001/factsheets/aminopyralid.pdf on January 13, 2010.

Zavaleta, Erika. 2000. Valuing Ecosystem Service Lost to Tamarix Invasion in the United States. Invasive Species in a Changing World. Island Press, Washington D.C.

Warner, P.J., C.C. Bossard, M.L. Brooks, J.M. DiTomaso, J.A. Hall, A.M. Hawald, D.W.Johnson, J.M. Randall, C.L. Roye, M.M. Ryan, and A.E. Stanton. 2003 Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands. (www.caleppc.org) and www.swvma.org) California Exotic Pest Plant Council and Southwest Vegetation Management Association. 24 pp.

APPENDIX A, SUMMARY OF PUBLIC COMMENTS

Table 13A. Summary of Public Comments during Scoping Period (8/18/2010 – 09/17/2010)

Comment	Resolution or Use	Letter/comment and date
Supports efforts of the Forest to remove invasives in upper watershed for health of entire watershed	Comment noted.	Santa Clarita Organization for Planning and the Environment . Lttr. 9-17-2010
Supports restriction on heavy equipment and wants hand removal to be method of choice.	Comment noted. An alteranative was developed that does not include herbicides and focuses on hand removal. Heavy equipment is restricted.	Santa Clarita Organization for Planning and the Environment . Lttr. 9-17-2010
Wants the FS to explore use of Recovery Act funds to provide for salaries for hand removal or funding Conservation Corps positions.	The ANF is very supportive of using these types of crews and volunteers to assist in invasive removal. Funding under the Recovery Act is no longer available.	Santa Clarita Organization for Planning and the Environment . Lttr. 9-17-2010
Wants FS to avoid the use of herbicides due to potential unknown harmful effects on wildlife. The watershed has many endangered species which could be adversely affected so pesticides should be avoided.	An alternative was developed that analyzes manual treatment only with no use of herbicides.. Design Features have been developed to protect water quality and minimize any potential adverse effects to wildlife. Chapter 3 addresses the impacts the 5 proposed herbicides would have on the environment.	Santa Clarita Organization for Planning and the Environment . Lttr. 9-17-2010
Wants FS to avoid the use of herbicides due to potential unknown harmful effects on workers and downstream water supplies.	An alternative was developed that analyzes manual treatment only with no use of herbicides. Design Features have been developed to protect water quality and minimize adverse effects on workers and others. Chapter 3 addresses the impacts the 5 proposed herbicides would have on the environment.	Santa Clarita Organization for Planning and the Environment . Lttr. 9-17-2010
Pesticides may have unknown effect on native wildlife.	This is a general Statement. All of the herbicides proposed for use are generally considered to be some of the safest for this type of use. The SERA Risk assessments have a lot of information on effects to wildlife. Design features have been developed to protect native wildlife.	Santa Clarita Organization for Planning and the Environment . Lttr. 9-17-2010
Accidents during manufacture and distribution of pesticides has been known to cause extensive enviromental harm to workers and habitats.	Manufacture and distribution of pesticides are outside the scope of this proposal and analysis. Regulations on manufacture and distribution are handled by other government agencies.	Santa Clarita Organization for Planning and the Environment . Lttr. 9-17-2010

Comment	Resolution or Use	Letter/comment and date
Asks that pesticides proposed for use be ranked according to biological breakdown and only those with shortest life should be used. Long lasting pesticides should be avoided due to their tendancy to migrate through the entire food chain.	All of the herbicides proposed for use have much shorter duration in the environment than long-term residency and bioaccumulation commonly thought of with species such as DDT. These herbicides either disappear quickly, are bound to soil particles and other processes that prevent long-term accumulation in the environment. See the SERA Risk Assessments for further information.	Santa Clarita Organization for Planning and the Environment . Lttr. 9-17-2010
Avoid removal projects during the bird nesting season.	Design Features have been added to protect nesting TES species and provide protection for nesting Migratory Birds.	Santa Clarita Organization for Planning and the Environment . Lttr. 9-17-2010
Does not support the mitigation for loss of wetlands by treating invasives somewhere else because this still results in a net loss of wetlands.	Outside the scope of this document. Decisions about mitigation of loss of wetlands on National Forest will be decided outside of this document. This document is limited to invasive species management and does not address other regulatory processes concerning wetlands.	Santa Clarita Organization for Planning and the Environment . Lttr. 9-17-2010
Detailed information, including project maps, should be kept for all projects at the District Office and be available to public. Also wants records including name of pesticide, amount used, area applied, date applied, and name of company or individual . This information is needed to trace future problems.	See the Project Monitoring Plan. Records requested will be developed and made available to the pubic on request. This type of project monitoring and reporting are essential to a successful invasive program.	Santa Clarita Organization for Planning and the Environment . Lttr. 9-17-2010
Since SCIPR has not been completed, permitting may take longer than anticipated. SCR Weed Management Area is still reforming under the Ventura Co. Ag. Commissioner.	Part of the purpose and need for the project is to support and cooperate with other efforts tot control invasive speies in the watershed.	Richard Sweet, Friends of the Santa Clara River. E-mail dated 8-30-2010
Suggest the use of a tractor with multiple attachments to assist with removal, chipping, spreading and loading. Very cost effective to chip arundo in place and treat regrowth with herbicides.	Comment noted. The proposed project allows for the use of small tractors and chippers to dispose of material.	Richard Sweet, Friends of the Santa Clara River. E-mail dated 8-30-2010
Chipping description needs to include use of a tractor.	Design Features restrict the use of large heavy equipment such as dozers. Small tractors and chippers are not precluded and are in the toolbox in this proposed integrated invasive species management program.	Richard Sweet, Friends of the Santa Clara River. E-mail dated 8-30-2010

Comment	Resolution or Use	Letter/comment and date
Expressed interest in doing work in association with Newhall Lands and Army Corps mitigation. Agreed to call Steve Loe for additional discussion.	Respondent never contacted Steve Loe to further discuss. Mitigation for impacts on private land are outside the scope of this document. That decision will not be made as a part of this project.	Newhall Lands, Sam Rojas. Phone call to Tasha Hernandez 09-01-2010
Supports the project, but is concerned that the ANF employees are not pulling enough weeds in the area.	Part of the reason the Forest has not made as much progress as the respondant wishes is the lack of NEPA documentation. Completion of this NEPA process will give ANF employees authorization to do invasive removal with a wider range of tools than previously allowed.	Gene Ruddel, Sand Canyon Homeowner. Phone call to Tasha Hernandez 9-03-2010
Supports the use of herbicides and wants to encourage the use of "Crossbow" focussing on Bear Divide and scotch broom.	Comment noted. Triclopyr, an ingredient in Crossbow is being proposed for use with restrictions to protect health and safety of the public, workers, and the environment. 2,4-D, another component of Crossbow is not being considered for use.	Gene Ruddel, Sand Canyon Homeowner. Phone call to Tasha Hernandez 9-03-2010
Wanted to make sure that the Forest Service wants to continue to work with the City on acquiring grants for invasive work.	The Forest has applied for a grant along with the City to treat areas of common interest.	City of Santa Clarita (Heather Merenda) Phone call to Tasha Hernandez 8-27-2010.
Asked to be added to the interested parties list for the Project and mailed or e-mailed the scoping documents.	Scoping documents were sent during the scoping period.	Californians for Alternatives to Toxics (Vanessa Vasquez). E-mail 5-10-2010.
Totally agrees with the aims and purpose of the project as proposed.	Comment noted.	Carolyn J.Therrio, Wrightwood resident. e-mail 8-22-2010
Wants NEPA coverage for their restoration projects mandated/authorized by the Angeles NF for mitigation/restoration.	Comment noted. This project will include all invasive weed projects on the Santa Clara/Mojave Rivers Ranger District in the Santa Clara Watershed. Restoration authorized by the Forest Service is an approved activity included in the proposed action.	Southern California Gas Co. (Anthony Klecha). E-mail of 9-17-2010.
Agree with the findings that treatment limited to hand tools is labor and time intensive and require re-treatment.	Comment noted. A full range of tools for invasive work are proposed for the integrated pest management.	Southern California Gas Co. (Anthony Klecha). E-mail of 9-17-2010.
Supports the adaptive management strategy and rapid response for control and/or containment.	Comment noted.	Southern California Gas Co. (Anthony Klecha). E-mail of 9-17-2010.
Supports focus on high and moderate priority species.	Comment noted.	Southern California Gas Co. (Anthony Klecha). E-mail of 9-17-2010.
Expressed interest in commenting on the project and asked to e-mailed the scoping materials.	Scoping materials sent during the scoping period..	Richard Artly, retired Nez Perce Forest Planner (email dated 4-7-2010)
Agrees with the need to remove invasives for the restoration of	Comment noted.	Dean Webb, Lancaster, CA. E-mail 9-8-2010

Comment	Resolution or Use	Letter/comment and date
flows and health of the River.		
Interested in planting trees along with Antelope Valley Group of the Sierra Club.	Outside the scope of this analysis. Comment passed on to Resource Officer planning future planting projects.	Dean Webb, Lancaster, CA. E-mail 9-8-2010
Asked that scoping materials be sent via e-mail to the Chair, Katherine Allen.	Scoping materials sent during the scoping period.	Dean Webb, Lancaster, CA. E-mail 9-8-2010
The District is supportive of the of the FS invasive project. Successful implementation of FS invasive treatment could reduce the infestation of invasive plants in Ventura Co.	Comment noted.	Ventura Co. Watershed Protection District. Norma Comacho, Director. Sept. 9, 2010 letter.
The District primarily uses glyphosate and considers it the least toxic for their work.	Comment noted.	Ventura Co. Watershed Protection District. Norma Comacho, Director. Sept. 9, 2010 letter.
The District encourages the FS to employ effective herbicide application methods while minimizing environmental impacts.	Comment noted. Environmental impacts are minimized by the development of many protective design features.	Ventura Co. Watershed Protection District. Norma Comacho, Director. Sept. 9, 2010 letter.
The proposed methods are a comprehensive powerhouse of useful and well considered tools to address the significant invasive threat to the watershed.	Comment noted.	Habitat Works.Org, Kim Clark and Tom Persons. Lttr. of Sept. 16, 2010.
Has seen the ecological devastation and have a great deal of experience and want to offer findings to help.	Comment noted.	Habitat Works.Org, Kim Clark and Tom Persons. Lttr. of Sept. 16, 2010.
Offers examples of where manual methods without the use of herbicides has not as successful as where they have been able to use herbicides.	This is why the Forest has two action alternatives, one with and one without the use of herbicides.	Habitat Works.Org, Kim Clark and Tom Persons. Lttr. of Sept. 16, 2010.
Not being able to use herbicides results in having to do more re-treatments, and waste manpower that could be used on other high priority projects.	Comment noted.	Habitat Works.Org, Kim Clark and Tom Persons. Lttr. of Sept. 16, 2010.
In this proposed action, we are highly in favor of judicious prescriptions for the use of herbicides to control invasive plant species.	Comment noted.	Habitat Works.Org, Kim Clark and Tom Persons. Lttr. of Sept. 16, 2010.
The Forest Service protocol for herbicide use is highly stringent and minutely taylored to to safety standards for the applicators, the ecosystem; its flora and fauna.	Comment noted.	Habitat Works.Org, Kim Clark and Tom Persons. Lttr. of Sept. 16, 2010.
In favor of all other non-herbicide methods as well as herbicides as they comprise a variety of tools with which to taylor invasive species control in areas with special considerations.	Comment noted.	Habitat Works.Org, Kim Clark and Tom Persons. Lttr. of Sept. 16, 2010.
Forest Service personnel involved in invasive species management are highly educated, trained	Comment noted.	Habitat Works.Org, Kim Clark and Tom Persons. Lttr. of Sept. 16, 2010.

Comment	Resolution or Use	Letter/comment and date
professionals and we have confidence they will conduct these activities with a high degree of due diligence and safety, with the best interest of the resources and ecosystem in mind.		
We encourage the FS and other concerned parties to support the Proposed Action especially allowing for the judicious and scientifically prescribed use of herbicides for the resource needs of future generations of wildlife and humanity.	Comment noted.	Habitat Works.Org, Kim Clark and Tom Persons. Lttr. of Sept. 16, 2010.
It is very important that the Bouquet Canyon residents be informed and suggests a potential meeting to provide an overview so the residents will know what is going on and be more inclined to support the work.	Comment noted. FS participated in a lower Bouquet Canyon meeting of those interested in invasive removal. Another meeting is being planned with the Bouquet interested parties before specific projects start.	Roger A. Haring, Bouquet Canyon resident. E-mail letter submitted Aug. 24, 2011.
Concerned that tree tobacco is only listed as moderate priority. Believes that an analysis of the species in Bouquet and tributaries might raise it to a higher level.	Based on your experience and ours in lower Bouquet and San Francisquito we are raising tree tobacco to the high priority plants.	Roger A. Haring, Bouquet Canyon resident. E-mail letter submitted Aug. 24, 2011.
Supports the use of tarping as a tool. Suggest use of clear polyethylene plastic may be optimal.	Comment noted.	Roger A. Haring, Bouquet Canyon resident. E-mail letter submitted Aug. 24, 2011.
Supports the use of Frill or Hack and Squirt for control of Arundo because it allows the herbicide to penetrate deep into the root system. This is critical to controlling the root system in the long run.	Comment noted.	Roger A. Haring, Bouquet Canyon resident. E-mail letter submitted Aug. 24, 2011.
Suggest the use of a tool called the EZ-Ject herbicide lance to treat tree of heaven.	This method is acceptible and provided for in the proposed action.	Roger A. Haring, Bouquet Canyon resident. E-mail letter submitted Aug. 24, 2011.
Suggest FS being a part of Bouquet Canyon residents and cooperating agencies in a meeting to discuss invasives to be held by Roger and NRCS. Agree that a canyon-wide meeting prior to actual implementation would be good.	FS attended the downstream invasive meeting and described what the FS is proposing in the Proposed Action.	Phone Conversation with Roger Haring on Sept. 13, 2010.
In 2007 I attempted to contact ANF in regard to a buildup of debris in the riparian area both inside and outside the Forest boundary. The Forest never followed up with me and the Buckweed Fire burned through damaging resident cabins and private property as well as the environment. This was neglect on FS part.	This is outside the scope of this project, but the FS is extremely interested in working cooperatively in the future. Please contact the Ranger or their staff with issues such as this.	E-mail from Roger Haring on Oct. 12, 2010.

Table 13B - Summary of Public Comments during Comment Period on Preliminary Environmental Assessment (July 16, 2012 – August 15, 2012)

Comment	Resolution or Use	Letter/comment and date
Support for Alternative 2, the Proposed Action, encouraged by the inclusion of all invasive projects on the District	Support for alternative is noted. This is the alternative selected in the decision.	So Cal Gas, August 14, 2012
Agrees that only using hand tools is costly, labor and time intensive, and often requires re-treatment to be effective.	The Forest Service has made the same conclusion regarding hand tools (EA, pg. 61-62), agreement is noted.	So Cal Gas, August 14, 2012
Requst that existing, pre-approved Restoration Plans be modified to allow approved herbicide use, as described in the EA.	See Decision Notice (pg. 1) for the project. Decision states: "Existing projects and plans that include invasive species treatments will be reviewed and adjusted for consistency with direction in the EA."	So Cal Gas, August 14, 2012
Request alignment of priority species identified under EA's Alternative 2 and those idenfified under existing Restoration Plans for the ANF.	See Decision Notice (pg. 1) for the project. Decision states: "Existing projects and plans that include invasive species treatments will be reviewed and adjusted for consistency with direction in the EA." Decision Notice also states: "The high and moderate priority species listed in Table 1 (EA, pg. 14) would be the focus of most treatments. Other species listed in Table 14 (EA, pg. 110) may be treated on a site specific basis, but with greater emphasis on control and containment than eradication" (pg. 2) Existing restoration plans are outside the scope of this decision, however, to bring consistency and to prioritize treatment activities, the Decision Notice commits the Forest Service to review existing restoration plans and modify them to be consistent with this EA.	So Cal Gas, August 14, 2012
Request that the 5% performance standard for red stem filaree and any	The EA characterized red stem filaree as a "common componenet	So Cal Gas, August 14, 2012

Comment	Resolution or Use	Letter/comment and date
other low priority species be removed.	of all vegetation types" (EA, pg. 56), and states that species such as red stem filaree are "ubiquitous throughout the Forest; therefore, have high potential to invade the recently treated areas. Red stem filaree is a low priority species in Table 14 as ranked by the California Invasive Plant Council (EA, pg. 110-111). This information is correct, and will be considered in reviewing and modifying existing Restoration Plans. See responses to the two comments above.	
Should the Forest Service decide not to concur with the request to remove the 5% performance standard for red stem filaree from existing Restoration Plans, red-stem filaree should be added to Appendix C to clarify that the containment or supression of this species could include herbicide as a tool.	Including red stem filaree in Appendix C is not necessary. Existing Restoration Plans will be reviewed and modified to be consistent with the EA. See reponses to three comments above. Red stem filaree is a lower priority for treatment, but treatment may occur with and emphasis on control and containment instead of eradication (Decision Notice, pg. 2). If treated, herbicide could be used on red stem filaree.	So Cal Gas, August 14, 2012
Questions on Table 5, with an estimated length of 100 stream miles in the Boquet Canyon level 6 watershed. How was the 100 miles calculated? Does it include all tributaries, which are the main tributaries?	Response by e-mail, July 29, 2012: Mileages were calculated using GIS data, it includes all tributaries of Boquet Creek including intermittent streams, the largest tributaries are Texas Canyon, Mystic Canyon, Fall Canyon, and Vasquez Canyon.	Roger A. Haring, e-mail, July 29, 2012
100 stream miles for Boquet still seems too high, could an alternate method be used to get a number, such as an average tributary length ?	Response by e-mail, July 30, 2012: checked with GIS staff and new data was used which included more streams. Additional response on July 30, 2012: Miles may be a high estimate, but best available data was used, and should be accurate enough for a programmatic level.	Roger A. Haring, e-mail, July 31, 2012
Acknowledges that a more exact number of stream miles may not be big	Reponse by e-mail, July 31, 2012: All tributaries are included so we	Roger A. Haring, e-mail, July 31, 2012

Comment	Resolution or Use	Letter/comment and date
concern at programmatic level, but the EA may overestimate creek drainage, which may spread treatment over a wider area than necessary, and could focus treatment aw away from a single creek or drainage.	are able to treat any areas where invasives are detected. Mileage estimates should not affect on the ground implementation. Additional response on July 31, 2012: Project is 15 years so Forest Service wanted to be able to treat as new problems show up. Small infestations higher up in a stream may cause problems downstream.	
If USFS spends time examining any and all "potentially working" tributaries, time may be lost solving the very specific problem of the main watershed in Boquet Canyon.	Response by e-mail, July 31, 2012: Agree that it is important to prioritize, Forest Service also tried to maintain consistency with similar project on San Gabriel District.	Roger A. Haring, e-mail, July 31, 2012
Comments not intended to cause alarm or delay in process. Very much supports efforts and is sure stakeholders see benefits of the project. Recently came across information on biocontrol for brome species. Biocontrol may provide more cost effective method when large territories become invaded. Current research is looking at Pyrenophora semeniperda, a fungus from Eurasia. Bottomline is that use of integrated methods is essential and herbicides are not panacea.	Response by e-mail August 17, 2012: Thank you for comments, many people including the Forest Service are in the war against invasives together. The Decision Notice has not selected biocontrol as a treatment method at this time. Only one species, hairy weevil, is considered in the EA. This species would only be used after additional NEPA review determines consistency with the EA and NEPA from other agencies. The species noted in the comment has not been reviewed in a NEPA document by APHIS, is not included in the EA, and is therefore will not not be used at this time.	Roger A. Haring, e-mail, July 31, 2012
Asked to be added to project contact list and forwarded links to all information provided to the public regarding this project to date.	Response by e-mail, July 20, 2012: Word document attached that has link to website with all public documents. Will add commenter to project contact list.	Jason Weiner in behalf of Ventura Coastkeeper Program, e-mail July 20, 2012
Asked when is the comment deadline	Response by e-mail July 19, 2012: 30 days from date e-mail notice was received, will consider comments even if made after deadline.	Heather Merenda, City of Santa Clarita, e-mail July 19, 2012

APPENDIX B - ADDITIONAL INVASIVE PLANT INFORMATION

Table 14 provides a list of invasive plant species that are presently known to occur within or near the project area. The list shows which plants are presently within the project area; Cal-IPC inventory categories; CDFA ratings; and the Santa Clara Mojave River Ranger District (SCMRD) priority.

Two of the important components of understanding the potential of invasive plant spread are their reproductive potential and mechanisms for distribution, including vectors for dispersal. The mode of dispersal is the physical characteristics that individual species have evolved to aid in the dispersal of their reproductive parts (e.g. seed, propagules) to colonize new areas. Reproductive potential is consider high when the species is able to have some combination of the following: reach reproductive maturity quickly (less than 2 years), produces prolific quantities of viable seed, has a long lived seedbank, viable seed production with self-pollination and cross pollination, has quickly spreading vegetative structures, ability to reproduce clonally, and/or resprouts readily when above ground portions of the plant are removed. Table 15 identifies the priority species reproductive mechanisms that have been identified (Cal-IPC 2003) to allow invasive species to rapidly spread and reproduce.

Dispersal vectors (table 16) involve the environmental factors that aid dispersal of species' reproductive parts. For example, some species (e.g. Spanish broom) have fat bodies on their seeds that attract ants, which haul the seeds off, and aid in dispersal. Abiotic factors can aid as vectors for dispersal, like water assisting in dispersing vegetative propagules of arundo downstream or wind blowing the light seeds of tamarisk both up and downstream. Humans and human activities have been identified as the greatest vectors associated with the spread of invasive species.

Another component of the mechanisms of plant invasion intrinsically related to vectors is suitable pathways for invasive plant species to move from one suitable environment to another. Important pathways applicable in the project area include roads, water course ways, private property, water inputs (dams), and hiking trails. For example, roads are thought to promote invasive plant distribution and abundance due to two important mechanisms: the creation of suitable habitat (road maintenance disturbance and reduced competition from native plants) and the increase in vectors (e.g. vehicles, animals) (Hastings et al. 2004). These pathways are often the sites of greatest vegetation invasion, as they often combine high risk factors for invasion, such as continuous disturbance and higher frequencies of vectors.

The ecological amplitude, or range of ecological conditions a species can tolerate, can determine the distribution of a species. The greater the ecological amplitude, the broader the range of habitat an invasive species can invade. Table 17 shows the known habitats for the high and moderate priority invasive plant species that are in California and other places with analogous climate and habitats to that found in California. The more a species is a habitat generalist, the greater its chances of survival and perpetuation, due to the reduction of habitat barriers.

Table 14. Invasive plants known to occur in and near the project area. Cal-IPC inventory categories, CDFA ratings, and the Santa Clara/Mojave Rivers Ranger District (SCMRRD) priority.

Common name (Cal-IPC, Calflora)	Taxon name	Cal-IPC	CDFA	SCMRRD Priority
In Project Area				
Eupatory	*Ageratina adenophora*	Moderate		Moderate
Creeping bentgrass	*Agrostis stolonifera*	limited		Low
Tree of Heaven	*Ailanthus altissima*	Moderate	C	High
Giant reed	*Arundo donax*	High	B	High
Wild oats	*Avena sp.*	Moderate		Low
Black mustard	*Brassica nigra*	moderate		Low
Ripgut brome	*Bromus diandrus*	Moderate		Moderate
Soft brome	*Bromus hordeaceous*	limited		Moderate
Redbrome	*Bromus madritensis var. rubens*	High		Moderate
Cheatgrass	*Bromus tectorum*	High		Moderate
Hoary cress	*Cardaria draba*	Moderate	B	Low
Hairy whitetop	*Cardaria pubescens*	limited	B	Low
Italian thistle	*Carduus pycnocephalus*	Moderate		Low
Iceplant	*Carpobrotus chilensis*	High		Low
Spotted knapweed	*Centaurea maculosa*	High	A	Moderate
Tocolote	*Centaurea melitensis*	Moderate		Low
Bull thistle	*Cirsium vulgare*	Moderate		Low
Rockrose	*Cistus sp.*	limited		Low
Pampas grass	*Cortaderia jubata*	High		Moderate
Pampasgrass	*Cortaderia selloana*	High		Moderate
Bermudagrass	*Cynodon dactylon*	Moderate		Low
Scotch broom	*Cytisus scoparius*	High	B	Moderate
Orchardgrass	*Dactylis glomerata*	Limited		Low
Cape-ivy, German-ivy	*Delairea odorata*	High		Moderate
Purple veldt grass	*Ehrharta calycina*	High		Moderate
Red stem filaree	*Erodium cicutarium*	Limited		Low
Tasmanian blue gum, or red gum	*Eucalyptus globulus, or Eucalyptus camauldulensis*	Limited or moderate		Low
Edible fig	*Ficus carica*	Moderate		Low
Fennel	*Foeniculum vulgare*	High		Moderate
French broom	*Genista monspessulana*	High		Moderate
English Ivy, Algerian ivy	*Hedera helix, H. canariensis*	High		Moderate
Velvet grass	*Holcus lanatus*	moderate		Low
Smooth cats ear	*Hypochaeris glabra*	limited		Low
Rough cats ear	*Hypochaeris radicata*	Moderate		Low
Italian ryegrass	*Lolium multiflorum*	Moderate		Moderate
White horehound	*Marrubium vulgare*	Limited		Low
California burclover	*Medicago polymorpha*	Limited		Low
Myoporum	*Myoporum laetum*	Moderate		Low
Tree tobacco	*Nicotiana glauca*	Moderate		High
Yellow oxalis	*Oxalis pes-caprae*	Moderate		Low
Crimson fountaingrass	*Pennisetum setaceum*	Moderate		Moderate
Hardinggrass	*Phalaris aquatica*	Moderate		Low
Bristly oxtounge	*Picris echiodes*	Limited		Low
Smilograss	*Piptatherum miliaceum*	moderate		Low
Kentucky bluegrass	*Poa pratensis*	Limited	B	Low
Radish	*Raphanus sativus*	limited		Low
Castorbean	*Ricinus communis*	Limited		Moderate
Black locust	*Robinia pseudoacacia*	Limited		Low
Himalayan blackberry	*Rubus armeniacus (Rubus discolor)*	High		Moderate
Curly dock	*Rumex crispus*	Limited		Low
Peruvian pepper tree	*Schinus molle*	Limited		Low
Mediterranean grass	*Schismus barbatus*	Limited		Low
Blessed milkthistle	*Silybum marianum*	Limited		Low

Common name (Cal-IPC, Calflora)	Taxon name	Cal-IPC	CDFA	SCMRRD Priority
Wild mustard	*Sinapsis arvensis*	Limited		Low
London rocket	*Sisymbrium irio*	Moderate		Low
Johnsongrass	*Sorghum halepense*	listed	C	Low
Spanish broom	*Spartium junceum*	High	C	Moderate
Saltcedar, Tamarisk	*Tamarix ramosissima*	High	B	High
Hedgeparsley	*Torillis arvensis*	Moderate		Low
Puncture vine	*Tribulus terrestris*	Not listed	C	Low
Gorse	*Ulex europaeas*	High		Moderate
Woolly mullein	*Verbascum thapsus*	limited		Low
Big periwinkle	*Vinca major*	Moderate		Moderate
Rattail fescue	*Vulpia myuros*	Moderate		Low
Mexican fan palm	*Washingtonia robusta*	Moderate		Low
English plantain	*Plantago lanceolata*	Limited		Low
Foxtail	*Setaria faberi*	Not listed	B	Low
Artichoke thistle	*Cymara cardunculus*	Moderate		Low
Canary Island date palm	*Phoenix canariensis*	Limited		Low
Crown daisy	*Chrysanthemum coronarium*	Moderate		Low
Eurasian watermilfoil	*Myriophyllum spicatum*	High		Low
Japanese brome	*Bromus japonicus*	Limited		Low
Kikuyugrass	*Pennisetum clandestinum*	Limited	C	Low
Rose clover	*Trifolium hirtum*	Moderate		Low
Sheep sorrel	*Rumex acetosella*	Moderate		Low
silverleaf cotoneaster	*Cotoneaster pannosus*	Moderate		Low
Yellow starthistle	*Centaurea solstitialis*	High		High
Canada thistle	*Cirsium arvense*	Moderate	B	Low
Olive tree	*Olea europaea*	Limited		Low
Parney's cotoneaster	*Cotoneaster lacteus*	Moderate		Low
Petty spurge	*Euphorbia peplus*	Not listed		Low
Pride-of-Madeira	*Echium candicans*	Limited		Low
Russian olive	*Elaeagnus angustifolia*	Moderate		Low

Table 15. High and moderate priority species reproductive mechanisms that have been identified (Warner et al. 2003).

Common name (Species name)	Reaches Sexual Maturity in up to 2 Yrs	Infestations have High Seed Density	Populations Produce Seed Every Yr	Seed Production Sustained Over 3 Mo/Yr	Viable in Soil for 3+Yrs	Self & Cross-Pollination (or No Fertilization)	Vegetative Structures Root at Nodes	Easy to Fragment & Establish	Resprouts when Cut/Grazed/ Burned
giant reedgrass *(Arundo donax)*	x						x	x	x
tamarisk*(Tamarix ramosissima, T. gallica, T. parviflora)*	x	x	x	x		x	x	x	x
Tree-of-Heaven *(Ailanthus altissima)*		x	x				x		x
yellow starthistle *(Centaurea solstitialis)*	x	x	x	x	x				
alligator weed *(Alternanthera philoxeroides)*	x						x	x	x
pampas grass *(Cortaderia jubata)*	x	x	x	x		x			x
bigleaf periwinkle *(Vinca major)*	x						x	x	x
Cape-ivy, German-ivy *(Delairea odorata)*	x		x				x	x	x
capeweed -sterile and fertile *(Arctotheca calendula)*	x	x	x				x	x	x
castorbean *(Ricinus communis)*	x		x	x	x	x	x	x	x
crimson fountaingrass *(Pennisetum setaceum)*	x		x	x	x	x			x
croftonweed, eupatorium *(Ageratina adenophora)*		x	x		x	x		x	x
English ivy *(Hedera helix)*			x		x	x	x		x
erect veldtgrass *(Ehrharta erecta)*	x	x	x	x			x		x

Common name (Species name)	Reaches Sexual Maturity in up to 2 Yrs	Infestations have High Seed Density	Populations Produce Seed Every Yr	Seed Production Sustained Over 3 Mo/Yr	Viable in Soil for 3+Yrs	Self & Cross-Pollination (or No Fertilization)	Vegetative Structures Root at Nodes	Easy to Fragment & Establish	Resprouts when Cut/Grazed/ Burned
fennel *(Foeniculum vulgare)*	x	x	x	x	x				x
French broom *(Genista monspessulana)*	x	x	x	x	x	x			x
gorse *(Ulex europaeus)*	x		x	x	x		x		x
Himalaya blackberry *(Rubus armeniacus)*		x	x	x	x	x	x		x
Italian ryegrass *(Lolium multiflorum)*	x	x	x			x			
onionweed *(Asphodelus fistulosus)*	x	x	x	x	x				
pampasgrass *(Cortaderia selloana)*	x	x	x	x		x			x
Portuguese broom *(Cytisus striatus)*		"unknown"	x		x				x
purple veldtgrass *(Ehrharta calycina)*	x	x	x	x		x	x		x
Russian knapweed *(Acroptilon repens)*	x	x	x		x	x	x	x	x
Scotch broom *(Cytisus scoparius)*		x	x	x					x
Spanish broom *(Spartium junceum)*	x	x	x	x	x				x
spotted knapweed *(Centaurea maculosa)*	x	x	x		x	"unknown"			x

Table 16. Dispersal vectors for various invasive plants.

Common Name (Taxon Name)	Non-Human/ Natural Seed Dispersal	Long Distance Dispersal (1+ Km)	Human Dispersal Mechanisms and Vectors
giant reed *(Arundo donax)*	water	x	boats, water tools, water recreation, water movement/management horticultural use, historic use as roofing material and fodder
tamarisk (saltedar, French, and smallflower) *(Tamarix ramosissima, T. gallica, T. parviflora)*	wind, water	x	fire management (resprouts), water management (irrigation, dams, river diversions, plow flood plains), grazing near riparian areas, horticultural use, erosion control, wind breaks
tree of heaven *(Ailanthus altissima)*	wind, water, animals	x	road maintenance, travel corridors, travel near/to water sources inc. springs, urban areas, horticultural use, logging activities, revegetate mine spoils
yellow starthistle *(Centaurea solstitialis)*	wind, animal	rare	spread by vehicles, machinery, road building and maintenance, rangeland and grassland management, livestock, any soil disturbance such as orchards, vineyards, pastures, movement of contaminated hay and uncertified seed, farm equipment (tractors), suburban development, ranching industry
Spanish broom *(Spartium junceum)*	seeds, insects, water	x	roadside planting, roadside travel, maintenance, and equipment, vegetation management (old fields, road banks, land slides, river islands and post-burn sites)
alligator weed *(Alternanthera philoxeroides)*	water	x	boats, water tools, water recreation, drawdown for waterfowl, irrigation ditches and ponds; historic use aquarium trade
pampas grass *(Cortaderia jubata)*	wind, animals	x	historical accounts of vehicle travel, logging, railroads, horticultural use
big periwinkle *(Vinca major)*	water	x	road side equipment; horticultural use
cape-ivy, German-ivy *(Delairea odorata)*	wind, water	x	vehicle travel, road side equipment
capeweed -sterile and fertile *(Arctotheca calendula)*	wind, water, animals		vehicle travel, road side equipment, stock fodder, livestock fur/hair/hooves, horticultural use
castorbean *(Ricinus communis)*	water, animals	x	vehicle travel, road side equipment, drainage ditches, railroads
crimson fountaingrass *(Pennisetum setaceum)*	wind, water, animals	x	vehicle travel, road side equipment/maintenance, cut and fill slopes, livestock, railroads, horticultural use
croftonweed, eupatorium *(Ageratina adenophora)*	wind, water, animals	x	travel of humans, livestock, vehicles, & equipment, intensive grazing, horticultural use, Agricultural contaminant in road construction & agricultural equipment
English ivy *(Hedera helix)*	wildlife	x	horticultural use, recent archeological/homestead sites
erect veldtgrass *(Ehrharta erecta)*	water	rare	sticks to clothing/boots, equipment, roadside maintenance and mowing
fennel *(Foeniculum vulgare)*	water, animals	rare	roadside travel and equipment, farm equipment, earth-moving machinery, agricultural produce,

Common Name (Taxon Name)	Non-Human/ Natural Seed Dispersal	Long Distance Dispersal (1+ Km)	Human Dispersal Mechanisms and Vectors
			livestock, clothing
French broom *(Genista monspessulana)*	water, animals	possible/rare	roadside travel and equipment, pastureland, road construction, feral pig rooting, fire management (sprouter), soil contaminated with seed, road grading equipment, maintenance machinery, human footwear, horses and other domestic animals and animal pathways/tracks, lumber activities and roads
gorse *(Ulex europaeus)*	insects, wildlife, water	x	land management like gravel bars, fence rows, overgrazed pastures, logged areas, and fire management (post-burn sprouter); horticultural use
Himalaya blackberry *(Rubus armeniacus)*	water, wildlife	x	agriculture activities, human spread by ingestion of seeds, planting of canes for fruit production, used for erosion control; spread by land clearing and debris disposal
Italian ryegrass *(Lolium multiflorum)*	seed only		seed dispersal by roadside travel and equipment, management of fields, orchards and vineyards; cultivated for erosion control; horticultural use
onionweed *(Asphodelus fistulosus)*	water, animals	x	seeds dispersed on vehicles, machinery (road works), clothing and farm produce, pastureland, fire management (post burn colonizer)
pampasgrass *(Cortaderia selloana)*	wind, animals	x	horticultural use, seeds dispersed via humans use to "decorate", vehicle travel and roadsides
Portuguese broom *(Cytisus striatus)*	seed, rain		road and home construction; timber harvest; road side machinery and equipment
purple veldtgrass *(Ehrharta calycina)*	wind, water, soil	rare/no	fire management (resprouter), grassland management, roadside travel and maintenance
Russian knapweed *(Acroptilon repens)*	water, wildlife	x	transportation corridors, management of rangeland, grazed areas, riverbanks, irrigation ditches, pasture, and cropland
Scotch broom *(Cytisus scoparius)*	seeds, insects	rare	roadside maintenance and equipment, fire management (resprouter), management of pastureland, forest borderland, soil or vegetation disturbing management activities (burning, herbicides)
spotted knapweed *(Centaurea maculosa)*	seeds, animals	x	roadside maintenance and travel, logging activities and vehicles, undercarriage and doors of recreational vehicles, trains, light aircraft landing at infested air strips, heavy machinery, florists, hay, log cabin kits, mud caked items like shoes and hooves, rangeland management, livestock activities
tree tobacco *(Nicotiana glauca)*	animals, water	x	spreads in disturbed soils, vacant lots, roadsides (maintenance and travel), streamsides, other riparian areas, and recently burned sites, horticultural use, recent archeological/homestead sites

Table 17. Vegetation type various invasive plant species are known to occur in.

Common name (Species name)	coniferous forest	oak woodland	chaparral	coastal sage scrub	riparian/wetland
giant reedgrass *(Arundo donax)*		x			x
tamarisk (saltedar, French, and smallflower) *(Tamarix ramosissima, T. gallica, T. parviflora)*					x
tree of heaven *(Ailanthus altissima)*	lower montane coniferous forest	x		x	x
alligator weed *(Alternanthera philoxeroides)*					x
Andes grass, purple pampas grass *(Cortaderia jubata)*	x				x
big periwinkle *(Vinca major)*	x	x		x	x
Cape-ivy, German-ivy *(Delairea odorata)*	x	x		x	x
capeweed -sterile and fertile *(Arctotheca calendula)*				x	x
castorbean *(Ricinus communis)*					x
crimson fountaingrass *(Pennisetum setaceum)*			x	x	x
croftonweed, eupatorium *(Ageratina adenophora)*	x			x	x
English ivy *(Hedera helix)*	x	x		x	x
erect veldtgrass *(Ehrharta erecta)*		x		x	x
fennel *(Foeniculum vulgare)*			x	x	x
French broom *(Genista monspessulana)*	x	x			x
gorse *(Ulex europaeus)*	x	x	x	x	x
Himalaya blackberry *(Rubus armeniacus)*	x	x			x

Common name (Species name)	coniferous forest	oak woodland	chaparral	coastal sage scrub	riparian/wetland
Italian ryegrass *(Lolium multiflorum)*		x	x		x
onionweed *(Asphodelus fistulosus)*			x	x	
pampasgrass *(Cortaderia selloana)*			x	x	x
Portuguese broom *(Cytisus striatus)*		x	x		
purple veldtgrass *(Ehrharta calycina)*		x	x	x	
Russian knapweed *(Acroptilon repens)*	lower montane coniferous forest	x	x	x	x
Scotch broom *(Cytisus scoparius)*	x	x	x		x
Spanish broom *(Spartium junceum)*			x	x	x
spotted knapweed *(Centaurea maculosa)*	x	x	x	x	x
yellow starthistle *(Centaurea solstitialis)*		x		x	

APPENDIX C POTENTIAL TREATMENT PRESCRIPTION OPTIONS

Treatment prescription herbicide and manual options to consider in integrated weed management for known and expected invasive plants[31]

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
Arundo donax (giant reed)	If plants are too tall to effectively spray from ground, cut them and use either a cut stump treatment of undiluted glyphosate (e.g. AquaMaster®) immediately after cutting, or allow for resprouting (3-6 weeks) and apply foliar or spot spraying application glyphosate (e.g. AquaMaster®) at 2-3% (at 25-40 gpa)and 0.5% of a non-ionic surfactant (e.g. Agri-Dex®). Otherwise treat with 3% glyphosate (e.g. AquaMaster®) plus 0.5% surfactant (at 60-100 gpa). Bending over tall plants prior to spraying can also be used on tall plants. Treatments later in summer or early fall are most effective.	Low volume foliar or spot spraying application of 5% imazapyr (e.g. Habitat®) plus 5% MSO surfactant applied in spring to 20-25% of leaf surfaces. Wait at least 6 months before considering retreatment.		Cutting is not effective.
Tamarix spp. (tamarisk, saltcedar)	Foliar or spot spraying application of imazapyr (e.g. Habitat®) at 1% in water with non-ionic surfactant (e.g. LI-700) at 0.25%. Late summer, early fall. Spray to wet (25-50 gpa). Imazapyr is slow acting (allow 2 seasons before considering retreating).	A tankmix of imazapyr (e.g. Habitat®) at 1% solution plus 3% solution glyphosate (e.g. AquaMaster®) plus 1% MSO surfactant, applied in fall, high volumes (spray to wet). Imazapyr is slow acting (allow 2 seasons before considering retreating).	If trees too tall to safely foliar or spot spray, cut stump with diluted imazapyr (e.g. Habitat ®) at 6 ounces/gallon water - 5% solution; or undiluted triclopyr ester[32] (e.g. Garlon 4 Ultra®), or basal bark with triclopyr ester (25%) in MSO or basal oil surfactant in fall (only to smooth-barked younger trees).	Handpulling smaller plants is effective, with some root removal.

[31] Any herbicide/surfactant planned for use within 100 feet of the waters edge must be aquatically approved.
[32] No tricopyr esters have been approved for aquatic use. When using this herbicide, treated areas must be a minimum of 100 feet from the banks of rivers and tributaries.

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
Ailanthus altissima (tree-of-heaven)	Different treatments depending on size of target. For small seedlings or sprouts (less than 4-5 feet tall), foliar or spot spraying application with 1-2% glyphosate (e.g. Accord Concentrate®) with 0.5% non-ionic surfactant, even coverage (10-30 gpa). For small saplings (trees with smooth bark), basal bark application with triclopyr ester (e.g. Garlon 4 Ultra®) at 25% mixed with a methylated seed oil (MSO) or basal oil surfactant, applying to lower 1-2 feet of stem, spray to wet in summer or fall. Larger trees without smooth bark, hack and squirt or frill then apply undiluted imazapyr (e.g. Arsenal AC®) or triclopyr amine (e.g. Garlon 3A®) in the summer or fall. Imazapyr is slow to act so don't expect fast changes (about a year).	If trees cannot be left in place to die (after hack and squirt or frill), then use a cut stump method; applying undiluted triclopyr ester (e.g. Garlon 4 Ultra®) or diluted imazapyr (e.g. Arsenal AC®) (6 ounces Arsenal AC® per gallon water) to the stump surface within minutes of cutting stem.		Hand cutting is ineffective. Young seedlings (not root suckers) can be pulled by hand but the roots must be removed or they will resprout.
Alternanthera philoxeroides (alligator weed)	Triclopyr amine (e.g.. Garlon 3A®) applied at rate of 1 lb ae/acre (2-3 pints/acre) mixed with 1% non-ionic surfactant applied at 20 gpa 2-4 times/year.	2% glyphosate solution (e.g. Accord Concentrate®) plus 0.5% non-ionic surfactant at 50 gpa.		Digging can be effective on very small populations, but care must be taken to remove all pieces, as rooting from fragments can occur.
Cortaderia jubata (jubata grass)	Glyphosate (e.g.. Accord Concentrate®) as a 2% solution plus 0.5% non-ionic surfactant applied at 50-100 gpa foliar spot spraying application in summer or fall (July – October)	Wicking application, using 30% glyphosate (e.g. Accord Concentrate®) plus 10% surfactant in water in early summer or fall.		Digging can be effective tool although very labor intensive for larger clumps.
Cortaderia selloana (pampas grass)	Glyphosate (e.g., Accord Concentrate®) as a 2% solution plus 0.5% non-ionic surfactant applied at 50-100 gpa foliar or spot spraying application in summer or fall (July - October).	Wicking application, using 30% glyphosate (e.g. Accord Concentrate®) plus 10% surfactant in water in early summer or fall.		Digging can be effective tool although very labor intensive for larger clumps.
Vinca major (big periwinkle)	Foliar or spot spraying application with 2% solution of glyphosate plus 0.5% non-ionic surfactant in water in the spring.	Foliar or spot spraying application with 2% solution of triclopyr amine (e.g. Garlon 3A®) plus 0.5% nonionic surfactant in water in the spring.		

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
Delairea odorata (cape ivy, German ivy)	0.5% glyphosate (e.g. Roundup Pro®) plus 0.5% triclopyr ester (e.g. Garlon 4 Ultra®) plus 0.1% silicone surfactant (e.g. Sylgard®) applied as foliar or spot spraying spray, spray to wet (70 gpa), late spring, early summer.			Hand pull in small areas and remove all fragments of stems and roots. Brush blade larger areas and follow up with manual or herbicide treatment.
Arctotheca calendula (capeweed)	Glyphosate at 2-3% (e.g. Roundup Pro®) (or 1.5% - 2.25% Accord Concentrate® plus 0.5% non-ionic surfactant) applied during flowering but before seed set.	Triclopyr ester (e.g. Garlon 4 Ultra® (4 lb ae/gallon)) at 2% solution plus surfactant. Applied during flowering.		Small, younger patches can be hand pulled, make sure bulk of roots are removed. Once stolons form do not attempt pulling as vegetative spread would be likely result.
Ricinus communis (castor bean)	Chlorsulfuron (e.g. Telar XP®) at 1 1/3 ounces of product per acre plus 0.25% non-ionic surfactant applied in late winter or early spring. Don't exceed 1 1/3 ounces of Telar XP® per acre.	Glyphosate at 8 qts or 2% (e.g. Roundup Pro®) applied in late winter or early spring at 100 gpa.	For larger plants, cut stump with 50% glyphosate (e.g. Accord Concentrate®) or 30% solution of triclopyr ester (e.g. Garlon 4 Ultra®), immediately after cutting plant	Handpull and remove root systems in small infestations. Make sure workers are wearing gloves.
Pennisetum setaceum (crimson fountaingrass)	Glyphosate (e.g. Accord Concentrate®)at 2% applied as a foliar or spot spray in spring and summer, including 0.5% nonionic surfactant.			Small infestations can be removed by uprooting or cutting with weed eaters. Larger plants will require picks or mattocks. If seed is present, seed heads should eb cut and bagged for off-site disposal.
Ageratina adenophora (croftonweed, eupatorium)	Glyphosate (e.g. Accord Concentrate®) applied as a 1% solution plus 0.5% non-ionic surfactant, spray to wet, in late summer or fall when actively growing.	Triclopyr ester (e.g. Garlon 4 XRT®) at 0.5% (2 qts/100 gallons water), high volume, in late summer or fall when actively growing. Throughly wet, especially at base.	Wicking application, using 30% glyphosate (e.g. Accord Concentrate®) plus 10% surfactant in water in early summer or fall.	Handpull and remove root systems in small infestations.
Hedera helix (English ivy)	From summer to fall, apply 3% solution of triclopyr ester (e.g. Garlon 4 Ultra®) with non-ionic surfactant. Thoroughly wet the foliage but not to point of runoff.	Some control may be achieved with glyphosate (e.g. Accord Concentrate®) as a 3% solution with 0.5-1% non-ionic surfactant, but repeat applications are necessary.		Handpull and remove root systems in small infestations. Solarization (i.e., tarping) can also be effective.

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
Ehrharta erecta (erect veldtgrass)	2% glyphosate (e.g. Accord Concentrate®), with added 0.5-1% nonionic surfactant, applied when plant is actively growing and green, in spring/early summer. Will likely require at least two years of chemical control followed by manual control of new seedlings.			Small areas can be handpulled.
Ehrharta *calycina (purple* veldtgrass)	2% glyphosate (e.g. Accord Concentrate®), with added 0.5-1% nonionic surfactant, applied when plant is actively growing and green, in spring/early summer. Will likely require at least two years of chemical control followed by manual control of new seedlings.			Small areas can be handpulled.
Foeniculum vulgare (fennel)	Triclopyr (either amine [e.g.. Garlon 3A®] or ester [e.g. Garlon 4 XRT®]) applied in spring/summer as a 2% solution (95 to 100% mortality).	Glyphosate (e.g. Accord Concentrate®) in late spring/summer as a 2% solution plus 0.5-1% non-ionic surfactant. (75-80% reduction in cover)		Hand pull or cut above-ground portions using handtools (small or diffuse populations only). For large areas, brush blade and follow-up with herbicide.
Genista monspessulana (French broom)	Triclopyr ester (e.g. Garlon 4 Ultra®) as a 2% solution plus 0.5-1% non-ionic surfactant applied to foliage in spring; even coverage is important. .	Glyphosate (e.g. Accord Concentrate®) as a 3% solution 0.5-1% non-ionic surfactant in spring or fall as foliar or spot spraying application.	Basal bark application using imazapyr (e.g. Stalker®) in a 6-10% solution or triclopyr ester (e.g. Garlon 4 Ultra®) in a 10-20% solution mixed with MSO (e.g. Hasten® or Competitor®) or a basal oil, applied in fall. Or a tankmix of the two - 3-5% imazapyr (e.g. Stalker®), 15-20% triclopyr ester (e.g. Garlon 4 Ultra®) in a basal oil or MSO.	Hand pull seedlings when soil is moist and infestation is small or scattered. Larger plants can be removed with a weed wrench.
Cytisus striatus (Portuguese broom)	Triclopyr ester (e.g. Garlon 4 Ultra®) as a 2% solution plus 0.5-1% non-ionic surfactant applied to foliage in spring; even coverage is important.	Glyphosate (e.g. Accord Concentrate®) as a 3% solution 0.5-1% non-ionic surfactant in spring or fall as foliar or spot spraying	Basal bark application using imazapyr (e.g. Stalker®) in a 6-10% solution or triclopyr ester	Hand pull seedlings when soil is moist and infestation is small or scattered. Larger plants can be

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
		application.	(e.g. Garlon 4 Ultra®) in a 10-20% solution mixed with MSO (E.g. Hasten® or Competitor®) or a basal oil, applied in fall. Or a tankmix of the two - 3-5% imazapyr (e.g. Stalker®), 15-20% triclopyr ester (e.g. Garlon 4 Ultra®) in a basal oil or MSO.	removed with a weed wrench.
Cytisus scoparius (Scotch broom)	Triclopyr ester (e.g. Garlon 4 Ultra®) as a 2% solution plus 0.5-1% non-ionic surfactant applied to foliage in spring; even coverage is important.	Glyphosate (e.g. Accord Concentrate®) as a 3% solution 0.5-1% non-ionic surfactant in spring or fall as foliar or spot spraying application.	Basal bark application using imazapyr (e.g. Stalker®) in a 6-10% solution or triclopyr ester (e.g. Garlon 4 Ultra®) in a 10-20% solution mixed with MSO (e.g. Hasten® or Competitor®) or a basal oil, applied in fall. Or a tankmix of the two - 3-5% imazapyr (e.g. Stalker®), 15-20% triclopyr ester (e.g. Garlon 4 Ultra®) in a basal oil or MSO.	Hand pull seedlings when soil is moist and infestation is small or scattered. Larger plants can be removed with a weed wrench.
Ulex europaeus (gorse)	Triclopyr ester (e.g. Garlon 4 Ultra®) as a 2% solution plus 0.5-1% non-ionic surfactant applied to foliage in spring; even coverage is important.	Imazapyr (e.g. Arsenal AC®) as a 2% solution plus 0.5% non-ionic surfactant applied to foliage in spring or summer	10-15% triclopyr ester (e.g. Garlon 4 Ultra®) in water plus an acidifier as a cut stump treatment.	
Rubus armeniacus (Himalayan blackberry)	Best if vegetation is cut first and then resprouts treated. Triclopyr ester (e.g. Garlon 4 Ultra®) using a 2% solution plus 1% non-ionic surfactant applied at flowering to green berry stage (late spring/early summer). Repeat as needed.	Glyphosate (e.g. Accord Concentrate®) applied as a 3 or 4% solution plus 0.5-1% non-ionic surfactant, to the foliage during flowering stage.		Handpull seedlings making sure to remove root system. Cut larger canes and remove root crown. Mow or brush blade larger infestations before hand removal.

Species	Herbicide Rx1	Herbicide Rx2	Herbicide Rx3	Cultural Rx
Lolium multiflorum (Italian ryegrass)	Glyphosate (e.g. Accord Concentrate®) as a 2% solution plus 0.5-1% non-ionic surfactant appied when the boot to head stage is reached.			
Asphodelus fistulosus (onionweed)	Glyphosate (e.g. Accord Concentrate®) as a 5% solution plus 0.5-1% non-ionic surfactant applied in spring during flowering	Chlorsulfuron (e.g. Telar XP®) at 1 1/3 ounces product/acre applied as a foliar or spot spray plus 0.25% non-ionic surfactant.		manual removal before seeds develop can control small populations, however partially buried plants can survive.
Acroptilon repens (Russian knapweed)	Chlorsulfuron (e.g. Telar XP®) at 1-3 ounces/acre plus 0.25% surfactant applied in fall to rosette. Spray to wet (20-40 gpa).	Aminopyralid (e.g. Milestone®) 5-7 oz/acre in spring plus 0.25 - 0.5% of non-ionic surfactant, applied in spring (eraly bud to flowering) or in the fall to dominant plants	Glyphosate (e.g. Accord Concentrate®) applied as a foliar or spot spray (3 lb ae/ac) at bud stage.	
Centaurea maculosa (spotted knapweed)	Aminopyralid (e.g. Milestone®) 5-7 oz/acre in spring plus 0.25% of non-ionic surfactant, applied from the rosette to the bolting stage.			
Centaurea solstitialis (yellow starthistle)	Aminopyralid (e.g. Milestone®) 4 oz/acre plus 0.25% of non-ionic surfactant, applied from the rosette to the bolting stage (November thru April). .			
Nicotiana glauca (tree tobacco)	Cut stump treatment with glyphosate (at 50% dilution or undiluted), imazapyr (8 ounces Arsenal AC®/gallon water or 16 ounces Stalker®/gallon water), or triclopyr ester at 30% dilution or undiluted. Glyphosate diluted with water, triclopyr and imazapyr diluted with MSO (e.g. Hasten®) or a basal oil.	Basal bark application using 20% imazapyr (eg Stalker®) in MSO or basal oil, applied in summer/fall.	Foliar or spot spraying application with glyphosate (eg Roundup Max®) at 2-3%. Provides partial control, at best.	Manual removal using weed wrench can be effective if most of major roots are removed. Cutting is ineffective.